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14. ABSTRACT

Project CHECO was established in 1962 to document and analyze air operations in Southeast Asia. Over the years the meaning of the acronym changed several times to reflect the escalation of operations: Current Historical Evaluation of Counterinsurgency Operations, Contemporary Historical Evaluation of Combat Operations and Contemporary Historical Examination of Current Operations. Project CHECO and other U. S. Air Force Historical study programs provided the Air Force with timely and lasting corporate insights into operational, conceptual and doctrinal lessons from the war in SEA.

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PROJECT
Contemporary
Historical
Examination of
Current
Operations
REPORT

ARMY AVIATION IN RVN - A CASE STUDY (U)

11 JULY 1970

HQ PACAF

Directorate, Tactical Evaluation
CHECO Division

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Project CHECO 7th AF, DOAC

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS PACIFIC AIR FORCES
APO SAN FRANCISCO 96553

OFFICE OF THE CHIEF OF STAFF

PROJECT CHECO REPORTS

The counterinsurgency and unconventional warfare environment of Southeast Asia has resulted in the employment of USAF airpower to meet a multitude of requirements. The varied applications of airpower have involved the full spectrum of USAF aerospace vehicles, support equipment, and manpower. As a result, there has been an accumulation of operational data and experiences that, as a priority, must be collected, documented, and analyzed as to current and future impact upon USAF policies, concepts, and doctrine.

Fortunately, the value of collecting and documenting our SEA experiences was recognized at an early date. In 1962, Hq USAF directed CINCPACAF to establish an activity that would be primarily responsive to Air Staff requirements and direction, and would provide timely and analytical studies of USAF combat operations in SEA.

Project CHECO, an acronym for Contemporary Historical Examination of Current Operations, was established to meet this Air Staff requirement. Managed by Hq PACAF, with elements at Hq 7AF and 7AF/13AF, Project CHECO provides a scholarly, "on-going" historical examination, documentation, and reporting on USAF policies, concepts, and doctrine in PACOM. This CHECO report is part of the overall documentation and examination which is being accomplished. Along with the other CHECO publications, this is an authentic source for an assessment of the effectiveness of USAF airpower in PACOM.

RICHARD M. CAMPBELL, Major General, USAF
Chief of Staff

[redacted]

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS PACIFIC AIR FORCES
APO SAN FRANCISCO 96553

REPLY TO ATTN OF: DOVD

11 July 1970

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FOR THE COMMANDER IN CHIEF

Maurice L. Griffith

MAURICE L. GRIFFITH, Colonel, USAF
Chief, CHECO Division
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FOREWORD

Three basic components completed the U.S. Army aviation spectrum in Southeast Asia based upon assignment. The first category was assigned by Tables of Organization and Equipment (TOE) to the two Army airmobile divisions; the 1st Cavalry; and the 101st Airborne Divisions--each equipped with an aviation group. The second category included aviation assets assigned by the TOE to U.S. Army units in other than an airmobile configuration. A conventional division had an aviation battalion plus an air cavalry troop; smaller ground units had aviation sections to provide general support.

This CHECO Report examines the third category--nonorganic aviation assets dedicated to provide various types of support at the Corps Tactical Zone (CTZ) level. The II, III, and IV CTZs each had one aviation group in a general support role. "Army Aviation in RVN - A Case Study" profiles the 12th Aviation Group in III CTZ, which supported II Field Force Vietnam, explaining how its aircraft were allocated and used by ground units.

INTRODUCTION

Organic U.S. Army aviation began during World War II with the assignment to each Army division of ten light fixed-wing aircraft for use in artillery spotting. By 1957, the original ten had increased to fifty aircraft; fixed-wing and rotary-wing. The expanded airmobile divisions of the mid-sixties contained more than 400 aircraft with the mission--significantly--greatly proliferated. The new Army airmobile concept of the 1960s included troop lift, aerial fire support, reconnaissance, logistical resupply, and a number of peripheral missions which called for corresponding increases (APP. I) in aviation units' doctrines, techniques, and aircraft (APP. II).[1/] (This concept also called for a series of agreements with the U.S. Air Force about ownership and operation of various air assets (APP. III).

Army aviation in the Republic of Vietnam (RVN) began in December 1961 with the deployment of 21 CH-21 helicopters to provide transportation for Army of Republic of Vietnam (ARVN) troops. From 1961 until 1965, Army aviation served mainly in the transportation role, with the added responsibility of medical evacuation of wounded ARVN soldiers. By the spring of 1965, it became apparent that ARVN alone was incapable of containing the Viet Cong/North Vietnamese Army (VC/NVA). In keeping with an agreement between the United States and the Republic of Vietnam, U.S. combat troops were deployed--first, the U.S. Marines, then, the Army 1st Cavalry Division (Airmobile). Equipped with 430 helicopters,

the 1st Cavalry Division arrived in the central highlands and occupied an area of operation (AO) 100 by 125 miles--an AO larger than any assumed by other divisions in past conflicts. The unit immediately joined battle with the VC/NVA forces.[2/]

Concurrent with the arrival of the 1st Cavalry Division in RVN, other U.S. ground units were deployed in-country. These divisions and brigades were not configured as "Airmobile," as was the 1st Cavalry Division, but rather had organic aviation units to carry out various air missions. Each division had an aviation battalion and an air cavalry troop, while brigades and smaller units had aviation sections of varying sizes and configurations.[3/] These units required Army aviation support beyond their own organic capability and consequently, the number of separate aviation units skyrocketed. In May 1965, the 12th Aviation Group (Combat) was activated followed by the 17th in December. The 1st Aviation Brigade was activated in 1966, followed by two additional groups, the 16th and 164th, in December 1967. Additionally, the 165th Group was activated as a Flight Facilities manager to cover the entire country. By June 1968, the 1st Aviation Brigade had five groups, plus the 212th Separate Combat Support Battalion--a total of 14 aviation battalions and three air cavalry squadrons (approximately 110 companies), with more than 2,000 aircraft. By mid-1970, the brigade had three combat aviation groups, one flight facilities group, and a separate battalion.[4/]

The relationship of the 1st Aviation Brigade to its subordinate units did not include operational control. It was responsible for

only administration, and overall training supervision, and professionalism. In short, the brigade was to provide operational aviation units for support, as directed, to Allied headquarters in the Republic of Vietnam for the conduct of tactical operations.[5/]

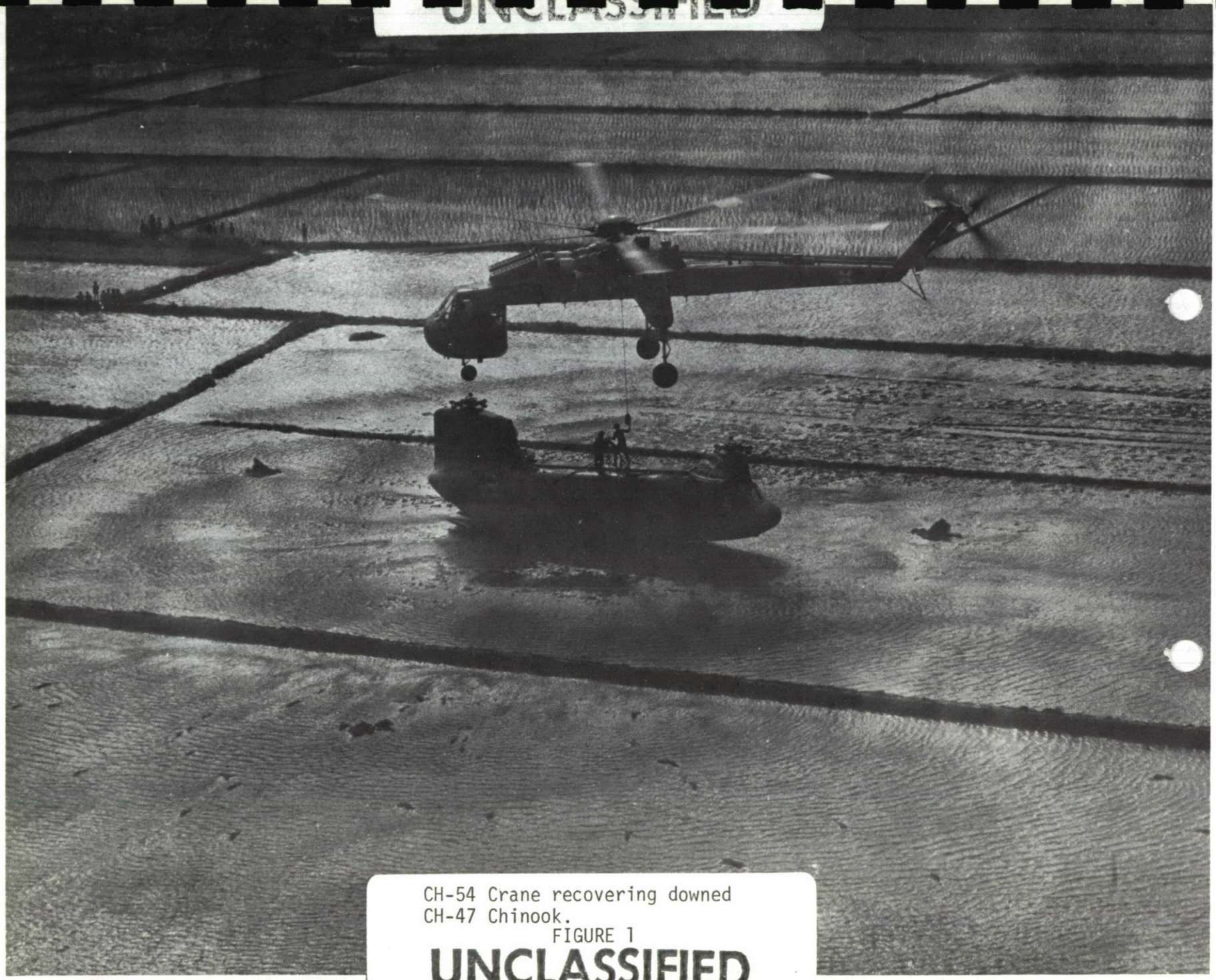
Nondivisional aviation support in RVN was a complex and highly sophisticated operation. Three of the Corps Tactical Zones (CTZ) each had an aviation group which operated as an aviation "pool" responsive to the units in the corps, tailored to meet the needs of tactical units in the respective corps area. The direction of the pool's assets was normally the responsibility of the U.S. Corps Headquarters G-3 (Operations). All Army aviation operations were directed toward supporting ground forces in combat, with Army commanders considering aviation another dimension in the battlefield. A helicopter was seen as "another vehicle, another weapons system"--but one that could fly. With this kind of logic, the ground commander had another asset at his disposal which he could use in planning and carrying out operations. Assets were generally allocated to the ground commander on a "dedicated" basis for a specified time. The allocations were based upon air asset requirements to complement the ground tactical plan. The commander programmed them into his operation as he would any portion of the unit's organic assets.

Army aviation units generally operated in conjunction with ground units, seldom carrying out independent operations. Neither was Army aviation a branch such as Infantry, Armor, or Artillery--although separate aviation units existed. Overall command always rested with a

commander from a level of ground command.

Other than for flying warrant officers, neither was Army aviation considered a career field for aviators. Employed in a flying capacity, these personnel were first basic branch officers: Infantry, Armor, Artillery, and the like, who knew how to plan, utilize, and employ Army aviation assets. Assigned to the careers they pursued within their own branches, they were not kept solely in the field of aviation.

In early 1970, this situation was modified because of the wide usage of aviation in the Republic of Vietnam. Although the basic philosophy remained unchanged, rated officers were being moved from flying assignment to flying assignment, and also took part in other activities. Foremost among these duties of Army aviation units was security. Certain aviation units were required to furnish personnel for guard duty and night defensive positions at their resident locations. Army aviation units were to be employed in a tactical role without augmentation of security forces. Since these units did not have organic security elements for that purpose, they used aircraft mechanics, avionics and communications specialists, and crew members, as well as administrative personnel to meet designated requirements. Inconducive to unit morale and to the retention of highly-trained personnel, this situation was duplicated to a degree for officers--rated and nonrated--but the problem was not as critical for them. The most significant aspect of this programming was the element of a safe, sustained sortie rate.



CH-54 Crane recovering downed
CH-47 Chinook.

FIGURE 1

[redacted]

Management improvements of the Army included establishment of crew-rest criteria. In the Republic of Vietnam, no individual aviator was allowed to exceed 140 hours flying time in any 30-day period. Flight time was restricted to 10 hours in any 24-hour period, or 15 hours in a 48-hour period, except in cases of tactical emergencies.

[redacted]

CHAPTER I

THE SYSTEM

The highest echelon in the organization of nondivisional and non-organic aviation in the United States Army, Vietnam (USARV), was the 1st Aviation Brigade which had administrative command responsibility for its four groups and a separate battalion. (Fig. 2) The Brigade's Commanding General was also the USARV Aviation Officer. This arrangement was duplicated at corps level, and in III CTZ, the 12th (Combat) Aviation Group (CAG) exercised command over five battalions and one air cavalry squadron. The Commanding Officer, 12th CAG, also served as the II Field Force Vietnam Aviation Officer.[1/]

There was no Army equivalent to the Seventh Air Force Tactical Air Control System. Instead, general support aviation was provided as directed by the Corps headquarters. The 12th CAG assets were dedicated to supporting mission requirements of II FFV--and to its direction of U.S., ARVN, and Free World Military Assistance Forces (FWMAF) in III CTZ. The group was under operational control (OpCon) of the CG, II FFV.[2/] Army Regulation 320-5 defined OpCon as "authority for the supported commander to assign tasks, determine composition of forces, designate objectives, and exercise that authority necessary to accomplish the mission."[3/] In layman's terms, the 12th Group constituted a "pool" from which Army aviation could be supplied to ground tactical units in the corps.

Operational responsibility for the pool rested with the II FFV G-3

Operations (Fig. 3). The G-3 Air Office had separate sections to deal with Tactical Air, B-52 target nomination, and Army Aviation. The latter was the concern of the Assistant G-3 Air Officer (who with his staff was collectively designated as the Army Aviation Element (AAE). The AAE was organically a part of the 12th CAG and was located at the II FFV headquarters to facilitate allocation of the group's assets. The AAE maintained a close relationship between the aviation supplier (the group) and the user (II FFV).[4/] In Air Force terms, the Army aviation system included a miniature Tactical Air Control Center (TACC) at Corps Headquarters G-3, which managed the assets furnished by a resident squadron or wing (the 12th Group).

The G-3 Air had authority to call upon aircraft from other units under operational control of II FFV, but this call-up was considered undesirable and seldom used. As one G-3 Air Officer stated, "In the Army, the higher commands do not like to bother with resources which belong to tactical units. Everything that the ground commander has he uses--his assets are his alone."[5/] In normal operations, the AAE dealt primarily with the 12th Aviation Group's aircraft.

The 12th CAG was organized as shown in Figure 4.[6/] Its combat aviation battalions (CABs) were comprised of different types of units, such as assault helicopter and aerial weapons companies, and medium and heavy-lift helicopter companies. The group also had an air cavalry squadron and a fixed-wing battalion. Some battalions were flexible, rather than fixed, allowing numbers and types of companies under each to

NONORGANIC AVIATION ASSETS UNDER USARV

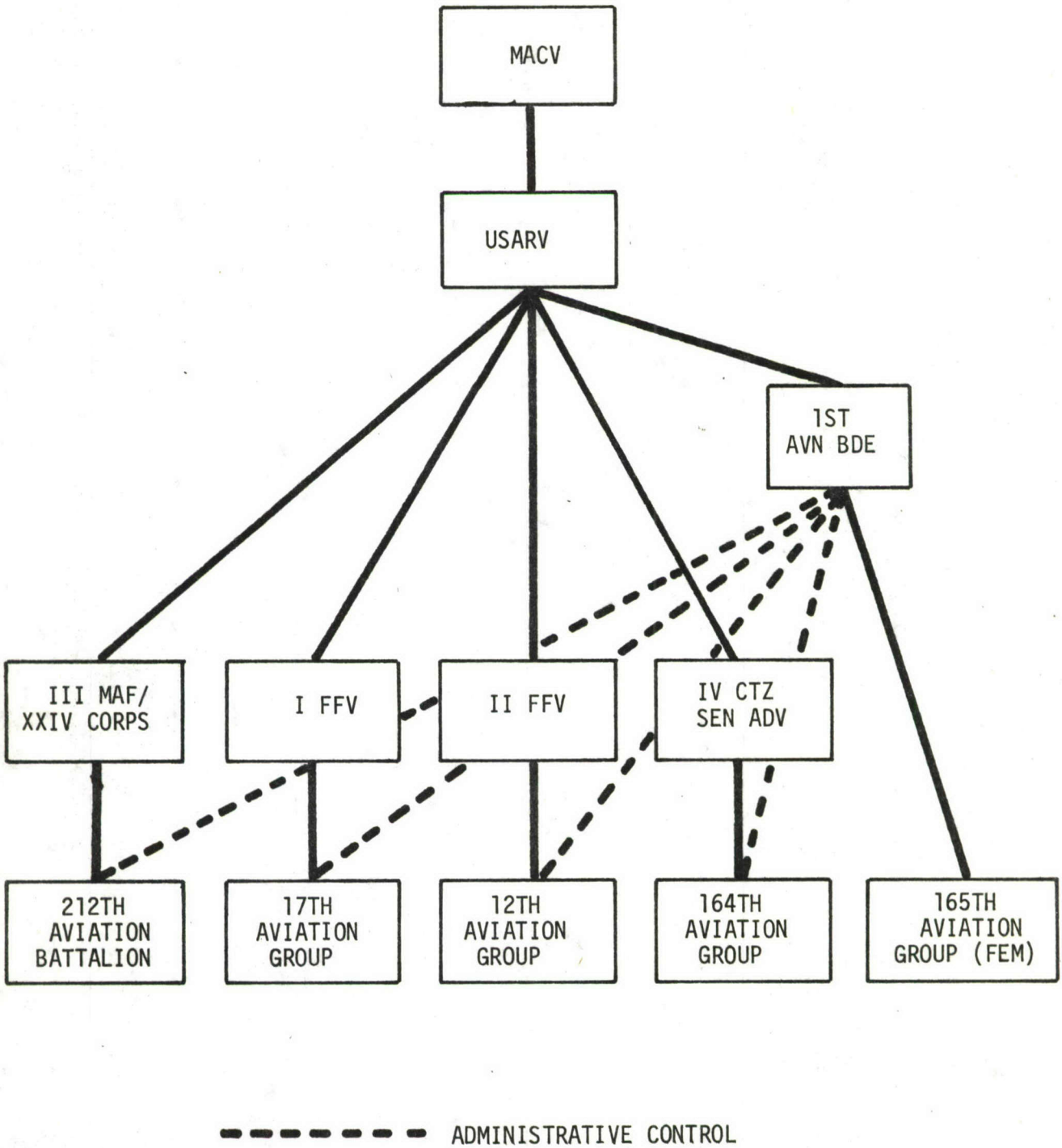
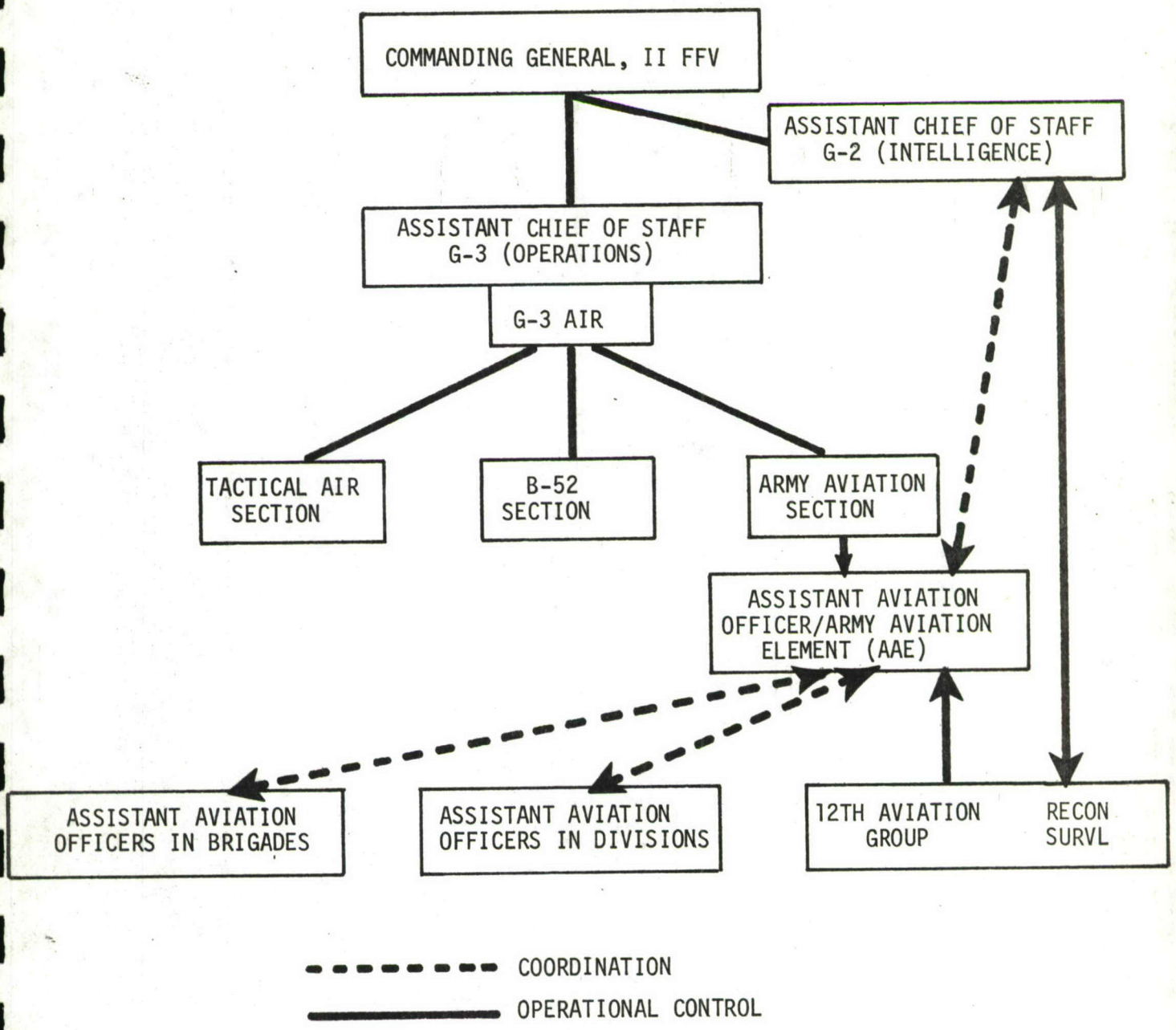


FIGURE 2

AVIATION CONTROL STRUCTURE UNDER COMMANDING GENERAL, II FFV OPERATIONAL CONTROL OF 12 TH GROUP ASSETS



NOTE: The AAE was organic to the 12th CAG but collocated with II FFV, and the Commanding Officer of the 12th CAG was also the II FFV Aviation Officer.

FIGURE 3

12TH AVIATION GROUP

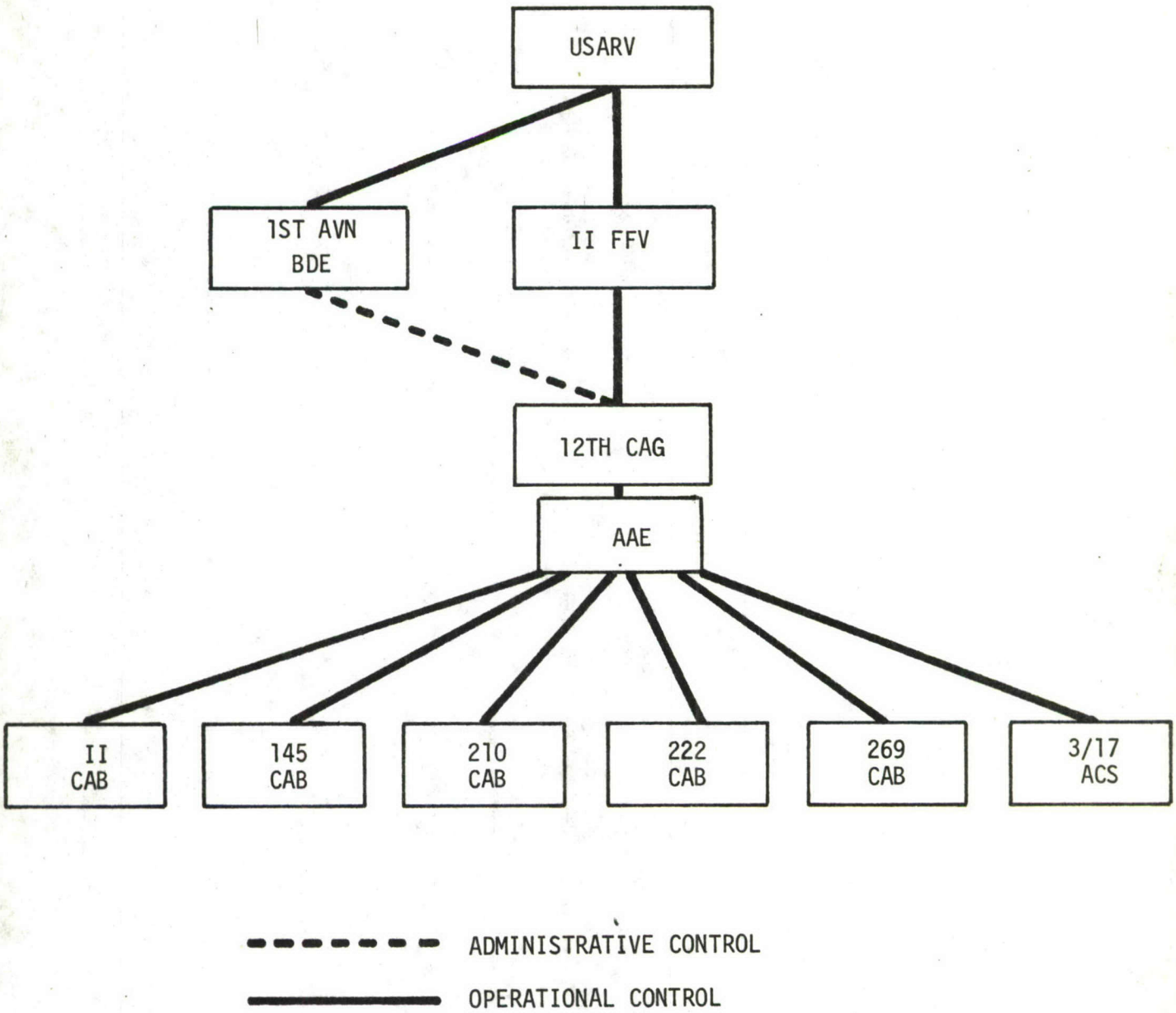


FIGURE 4

be varied--in other words, the mix could be changed. These flexible units were identified by the designation of companies. If the latter were numbered (11th, 128th, 222d), as opposed to lettered (A, B, C, D), the battalion was flexible; its companies were under the flexible configuration and were able to sustain independent operations with minimum support from battalion.

The battalions had different possible mixes. One had two assault helicopter companies (AHCs) and two heavy-lift companies; another had three AHCs and one aerial weapons company (AWC), and so on throughout the group.

Assault Helicopter Companies

Assault helicopter companies constituted the "bread and butter" units with ten of these assigned to the 12th CAG.[7] Basic allocations of AHCs were originally set up with major U.S. ground units supported on a dedicated basis. Usually two AHCs supported a division-size unit each day, and Army planners in the AAE attempted to assign the same AHCs to the same ground element. They saw the need for continuity between these supporting and supported organizations because ground commanders tended to use air assets differently.[8] One officer commented:

> *"The ground COs developed their own tactics and techniques to suit their areas of operations...Up north, for example, there were jungles and hills, and forests. The choppers had to come in vertically over 150-200-foot trees into holes in the vegetation. Down south in the Delta, the aircraft were used a lot with boats, and this required different techniques. And in rice paddy areas, troops have to be inserted in a totally different way...The*

point is that the areas are so different and the expertise that is developed in each should be kept there."

The II FFV planners followed this method of assignment as much as possible. In fact, certain higher echelon officials were reluctant to take aviation units out of areas in which they had been operating. They took their cue from the CG, II FFV, who once responded to such a proposed reassignment by saying, "Don't take that unit out of there; they've got web-feet!"[9/]

In terms of numbers, the AHCs furnished 128 aircraft per day to the II FFV. Of these, 125 were allocated to specific ground units and three were used to satisfy unplanned requirements. Army planners did not keep a reserve as such, but committed the AHCs for a standard programmed number of flying hours per day, with a surge capability for a limited time. Following any surge, the standard aviation practice was to return to the normal programmed commitment.[10/]

The AAE planned the basic allocations monthly, matching aviation to ground units. These allocations were seen as factors for planning purposes and could be modified as the month wore on and new situations arose. Subordinate tactical units forecast their requirements five days in advance and submitted the requests to the AAE, who coordinated with the G-3 to write a fragmentary order for the 12th CAG. Usually, Assault Helicopter Company allocations adhered to these priorities:[11/]

Priority 1: For the conduct of air assaults in operations directed by II FFV or higher headquarters.

Priority 2: For the conduct of air assaults in reaction to enemy action.

Priority 3: For the conduct of operations reacting to or exploiting hard intelligence.

Priority 4: For the conduct of operations to locate the enemy or obtain intelligence.

Priority 5: For the movement of a unit from one secure location to another.

After the requests were categorized as to priority, the Army Aviation Element checked them against the asset availability (which aviation units were in the best crew and maintenance posture, and which were closest to the requestor.) Then the daily allocations were finalized. The AAE became a coordinator, contacting the ground unit whose request had been approved. The type of specific mission was determined, as well as pick up points and arrival times. This information was passed to the battalion operations centers (BOCs) and the AHCs who were to satisfy the requirement. From this point on, the aircraft belonged to the ground commander for the specified time.[12/]

Assault Support Helicopters

Four assault support helicopter companies (ASHCs) under the 12th CAG furnished the medium and heavy-lift support to II FFV. Primarily, the mission of the lift companies was to carry ammunition, supplies, and personnel to units and fire support bases (FSBs) in areas which were inaccessible to surface traffic and unsuitable for fixed-wing operations.[13/]

The three medium ASHCs were tasked with providing six aircraft (CH-47) each day to II FFV, for a total of 18. The single heavy-lift company furnished four Cranes (CH-54s) per day. The process by which lift helicopters were allocated was similar to that of the AHCs. The AAE had a monthly planning figure based upon availability of aircraft and past requirements from ground units. Major ground units received a dedicated portion of the base figure, in terms of time--e.g., the 25th Infantry Division was given 20 hours per day; the Corps Artillery, 30. The ground units then submitted specific daily mission requests to use up the allotments.[14/]

These requests were initiated by the elements of the major ground units and were submitted in terms of cargo or personnel to be moved. Cargo movement requests normally passed through S-4 logistical channels, monitored by S-3 (Operations), while requests for the movement of personnel stayed within S-3 channels.[15/]

All requests were consolidated at the division or separate brigade level by the organic aviation staff sections. There they were recomputed--this time in terms of aircraft load--and the total number and type of aircraft required were determined. These data were transmitted to the AAE 12 hours before the mission was to be flown. The AAE matched the requests with the dedicated aviation assets and determined priorities based on criteria from II FFV G-3. The AAE then tasked the aviation lift company with the missions and each lift pilot was given a mission sheet that he was to follow through the day. The original requestor was

CH-54
FIGURE 5

CH-47
FIGURE 6

notified of support which would come the next day.[16/]

Unforeseen developments required the AAE to divert lift missions on the average of two or three per day. When a diversion occurred, dedicated support time had to be taken from the original requestor and given to one with a more immediate need. Army personnel in the AAE considered this to be a touchy situation and close attention to the total support picture was required to assure that all operational requirements could be met. As was the case with AHCs, the ASHCs had a limited surge capability from the normal 18 aircraft to about 24 per day, but this could not be sustained for a long period.[17/]

Air Cavalry

The 3d Squadron, 17th Cavalry, a battalion-size unit, provided II FFV with air cavalry assets. It was composed of three air cavalry troops (A, B, C) and one normal ground cavalry troop (D). Troops A and B were dedicated in early 1970 to the ARVN 5th Division and the U.S. 3d Brigade, 9th Infantry Division, and were not tasked daily or weekly by the Army Aviation Element. They received their missions directly from the supported headquarters and flew as directed within the ground areas of operations. Troop C received missions from the AAE, providing support to from five to seven different Allied units in III Corps, which required a weekly schedule passed down from the AAE. The schedule normally specified daily missions to be carried out during the following week, but more importantly, it told the troop which headquarters was to be supported.[18/]

The air cavalry troops flew 1900 to 2100 hours a month in support of their ground units. They were committed to furnish 50 percent of their aircraft daily. The squadron's goal in mission-ready aircraft was set at 75 percent at all times; however, due to combat losses, accidents, and unscheduled maintenance requirements, the squadron could only maintain about 73 percent of its aircraft in a mission-ready status. The difference between the daily commitment figure (50 percent) and the mission-ready figure (73 percent) was viewed as the surge capability.[19/]

Administrative, Utility, Surveillance, and Reconnaissance

Special categories of support were furnished to II FFV units by the 12th Group's 210th Aviation Battalion. It was called a fixed-wing battalion, although one of its companies was equipped primarily with helicopters. A few other helicopters were also assigned to the battalion headquarters.

Administrative and utility aircraft were assigned to two companies of the battalion. The 25th, called the Corps Aviation Company (CAC), was equipped with UH-1DH and OH-58 helicopters and a twin-engine, fixed-wing U-21 used mainly to transport the corps headquarters staff. The 54th was equipped with U-1 aircraft, which gave it light passenger and cargo capability, and was tasked with various utility missions. Both companies had set missions: the 25th was required to give a certain number of aircraft to II FFV Headquarters each day, and the 54th flew as directed by the 1st Aviation Brigade.[20/]

U-1
FIGURE 7

U-6
FIGURE 8

Aircraft from the 73d Aviation Company provided surveillance support for the major units under II FFV. The company's OV-1 Mohawks were configured with three different reconnaissance systems: photographic, side-looking airborne radar (SLAR), and infrared (Red Haze). Table of Organization and Equipment strengths for these systems were 4, 5, and 9 aircraft, respectively, for a total of 18 aircraft. At full strength, the company had a capability to fly one mission less than the total aircraft possessed in each category, or 15 missions per day--3 photo, 4 SLAR, and 8 Red Haze. As the number of aircraft varied, so did the commitment to fly missions. Although some substitution took place, the general rule was adhered to flying one mission per day less than the number of aircraft in the three modes. Army planners could and did schedule one kind of mission when another had been requested, if they decided that the substitute could perform the mission.[21/]

Surveillance mission requests originated at the division level, and were usually developed from intelligence sources. These requests were transmitted to the II FFV G-2 section for evaluation. The G-2 assessed the missions and decided which would be flown, taking into account the status of the surveillance assets. The G-2 telephoned the decision to the 73d Aviation Company on a hot line, one day before the missions were to be flown.[22/] The company operations center then fragged its crews.

The last category of aviation assets possessed by the 210th Aviation Battalion was called Reconnaissance Airplane. This support was furnished by the 74th and 184th Aviation Companies. The capability of the two companies, equipped with O-1 Bird Dogs, included artillery adjustment

(AA) and visual reconnaissance as the primary missions, with naval gunfire adjustment and radio relay as secondaries. Aircraft from these units could also direct USAF tactical airstrikes in certain situations and perform bomb damage assessment.[23/]

The 74th and 184th were required to provide a total of 29 O-1s each day to support II FFV units--18 from the 74th and 11 from the 184th. These missions were allotted to major ground units on a set basis, and changes were not required often. The battalion S-3, however, had the authority to direct changes in the missions that had been requested by the supported headquarters, although this was seldom done. Generally, the companies flew as directed by II FFV and the supported ground unit, based upon long-standing commitments.

[redacted]

CHAPTER II

AIRMOBILE OPERATIONS

"The whole purpose for the existence of airmobile assaults is to position combat rifle units and supporting troops on or within close assault distance of their tactical objectives...."

The basic Army aviation assets used to position troops near tactical objectives were the assault helicopter companies (AHCs).[1/] As mentioned earlier, the 12th Aviation Group had ten under its control, dedicated to providing an airmobile capability to II FFV ground units. The AAE managed the AHC allocation, and once the allocation was made, the AHC aircraft functioned much as an organic element of the supported ground unit.[2/]

Organization

Army doctrine specified that the AHC be organized in accord with infantry unit organization. In other words, the basic aviation vehicle, the UH-1D/H "Slick," was to carry the basic infantry unit, the squad. Actually, the squad consisted of nine men, whereas the Slick could carry only six or seven fully-equipped troops, due to environmental limitations. This limitation was considered during planning phases, and the aviation unit could carry the assault elements of the supported infantry unit.[3/]

The Table of Organization and Equipment of the AHC is shown in Figure 9. Two airlift platoons, each with 11 UH-1D/H helicopters,

[redacted]

constituted the lift capability. Each AHC also included an armed platoon with eight UH-1B/C gunships or six AH-1G Cobras to provide escort for the company's troop carriers.[4/] Thus, not only could the AHC carry the ground troops, but it had the ability to provide limited fire support and suppression in the event the enemy was encountered en route or near the objectives.

Department of the Army (DA) specified that the AHCs were to maintain a mission-ready status of 74 percent of TOE at all times. A Department of the Army study prepared in 1970, revealed that the AHCs could actually maintain a 76 percent availability. This meant, in terms of "blade-hours" that each AHC could provide about 2,800 hours of flying time per month and could sustain the rate indefinitely. (A blade-hour was the U.S. Army aviation basic planning figure for helicopters, rather than sorties of missions--if the blade were turning in the air or on the ground, blade-time was being used up. The 2,800 hours was an average figure--some AHCs flew more, some less. The study indicated that at full strength, each company could sustain approximately 3,100 hours per month. The companies, however, were seldom at full strength. The 2,800-hours figure was considered to be optimum, when taking into account the aircraft losses, and crew and maintenance limitations.[5/]

Breaking the planning figure down into a daily commitment, a helicopter could be used for six blade hours per day, in a nine-hour time span (called on-station time) and support for ground units was requested

ASSAULT HELICOPTER COMPANY CHART

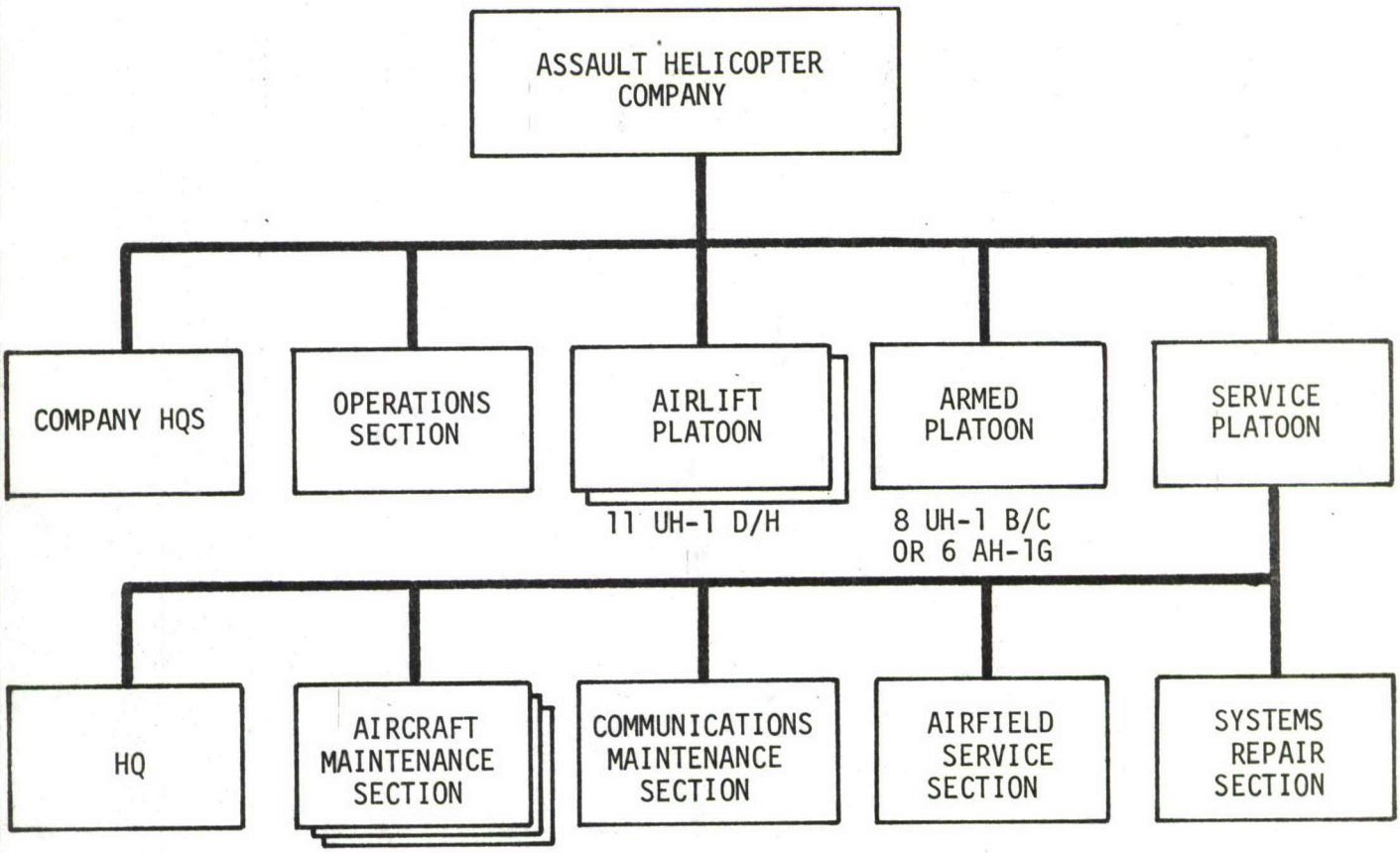
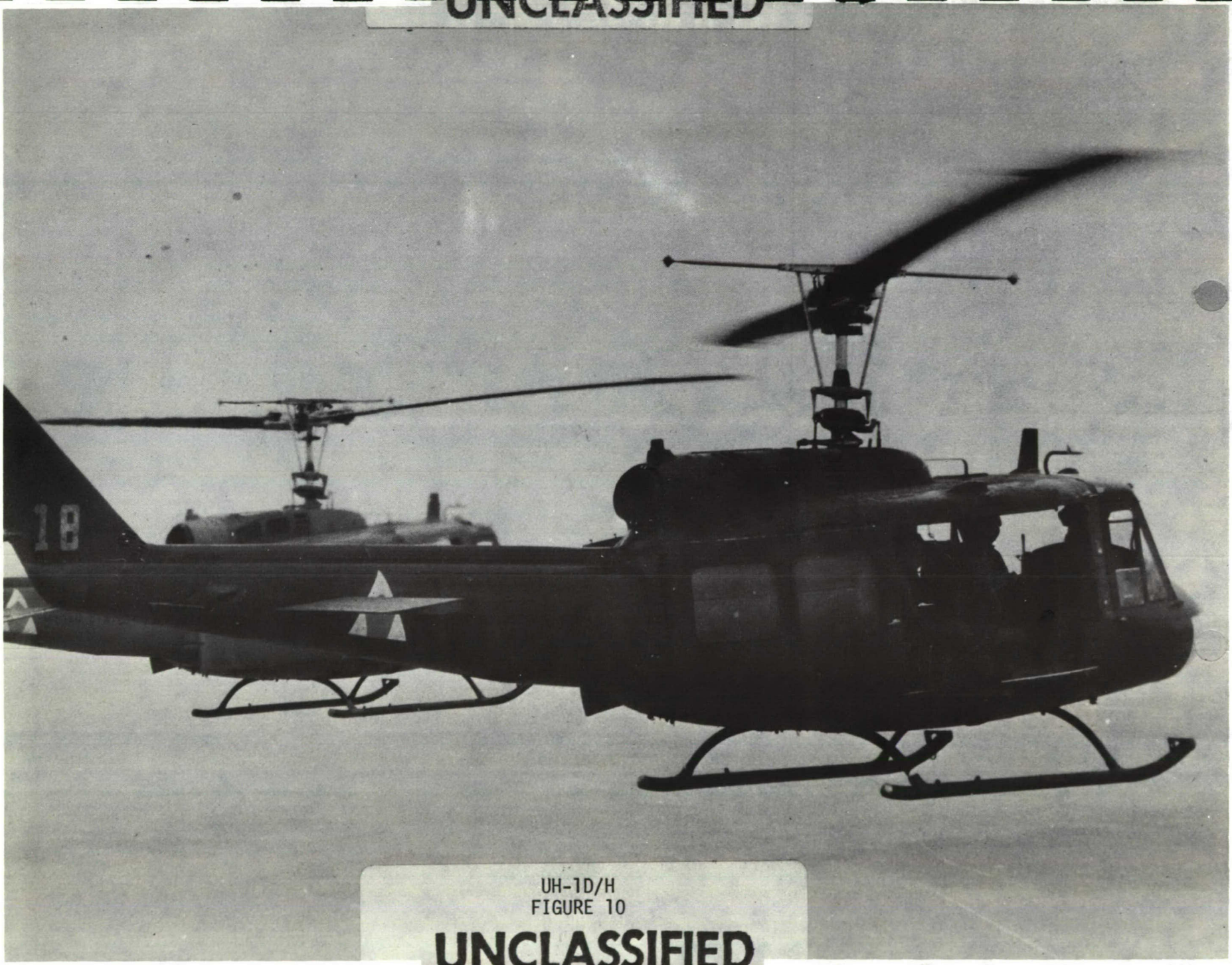


FIGURE 9



UH-1D/H
FIGURE 10

UH-1B/C Huey Gunship showing
Rocket Pods and Mini-Guns.
FIGURE 11

and allocated accordingly. Furthermore, the daily computation of blade hours could be done not only by individual aircraft, but also in terms of total hours flown by all the aircraft in a package. Special permission to exceed the daily allocated flying hours had to be obtained from II FFV.[6/]

A "package" was the term used to denote the AHC's daily commitment in aircraft. The normal package consisted of one command and control (C+C) UH-1D/H, eight UH-1D/H troop-carrying "Slicks", and four gunships, either UH-1B/Cs or AH-1G Cobras. The package concept had a degree of flexibility; as the enemy threat changed, the packages could be changed, too. In late 1969, the VC/NVA were being encountered in small units, (a platoon or less) and the packages were broken down into half-packages, or one C+C, four Slicks, and two gunships. Two or more gunships normally worked together to provide mutual support. AHCs were each required to furnish one package or two half-packages to II FFV each day.[7/]

Typical Daily Operation

Daily mission notification came from the AAE, or in the case of AHCs already under the control of a ground unit, a Liaison Officer (LNO) attached to the ground unit headquarters. If the notification included specific details about the coming mission, then the aviation unit could fly what they called a "preplanned" mission the next day. The aviators could then be given a detailed mission sheet in the evening to be followed the next day.[8/]

Usually, however, the missions were not of the preplanned type. The mission notification in these cases did not include detailed information, only data about supporting unit and reporting time. Sometimes the missions were drawn up the night before, or just prior to the next day's mission. In either event, coordination between the aviation element and the ground unit was required at all times.[9/]

All of the aircraft were under control of an Air Mission Commander (AMC), who reported to the ground unit headquarters about 30 minutes before the arrival of the package. The AMC flew in the C+C helicopter. He contacted the Airmobile Task Force Commander (AMTFC), who was the commander of the unit to be supported. Together, the two decided upon the employment of the aviation assets. The ground commander had overall control of the operation. The AMC advised about aviation capabilities, limitations, and risks. If a prohibitively high risk were involved, and the AMTC wished to continue, the AMC was required to perform the mission and inform his next higher aviation headquarters of the situation.[10/]

There was seldom a need for this, however, because Army ground commanders were familiar with capabilities and limitations of the aircraft from their basic branch training. Combat Arms courses included operations with aviation support. In many cases, the AMTFC was an aviator himself or had a few qualified aviators serving in his unit. Additionally, the AMFTC, if he had been in RVN for any length of time, knew what the aircraft could or could not do in the tactical environment of his AO. And, in most cases, the ground commander was willing to take

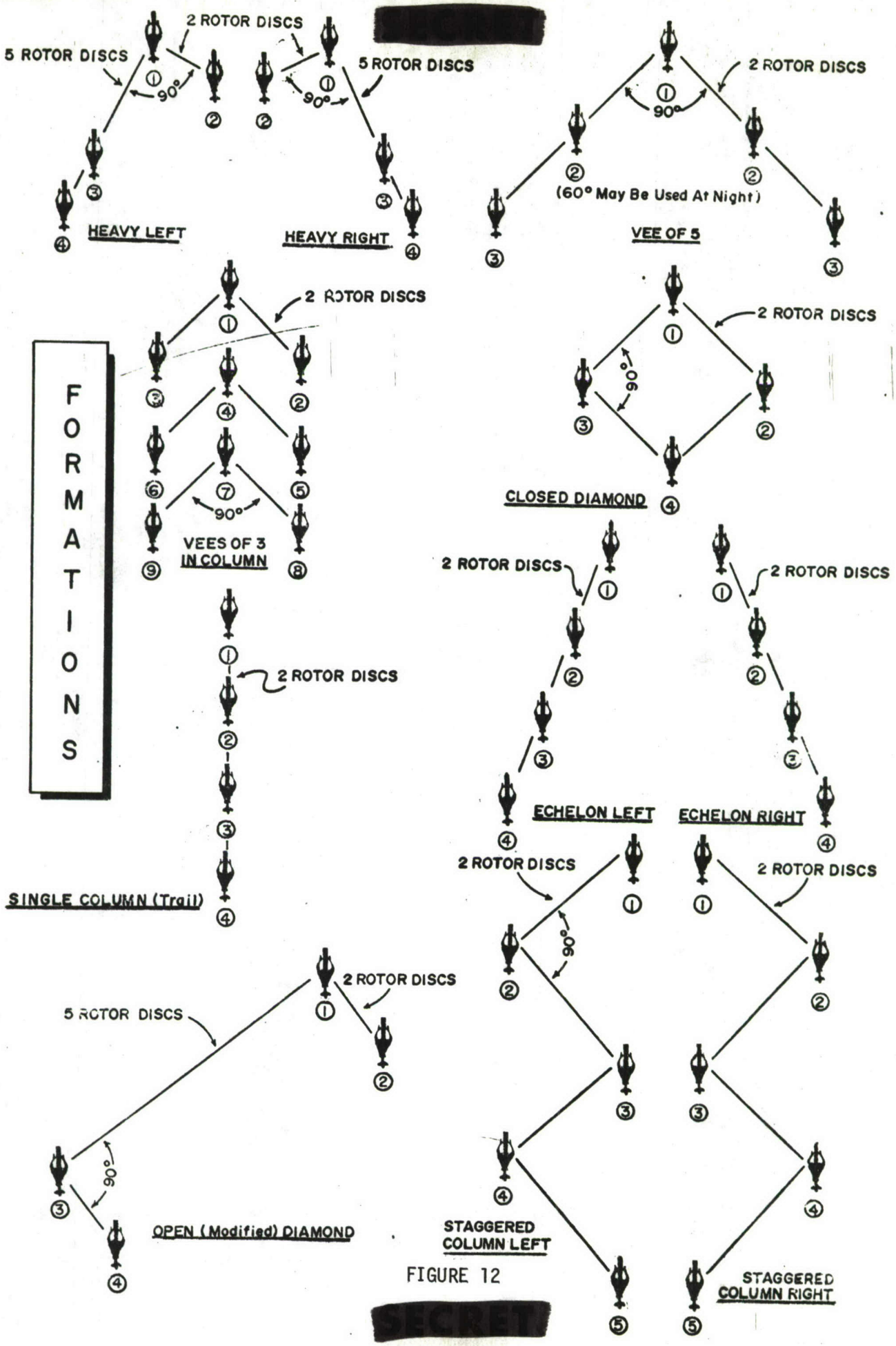

FORMATIONS
5 ROTOR DISCS
2 ROTOR DISCS
90°
HEAVY LEFT
HEAVY RIGHT
2 ROTOR DISCS
(60° May Be Used At Night)
VEE OF 5
2 ROTOR DISCS
CLOSED DIAMOND
2 ROTOR DISCS
VEES OF 3 IN COLUMN
2 ROTOR DISCS
SINGLE COLUMN (Trail)
2 ROTOR DISCS
ECHELON LEFT
2 ROTOR DISCS
ECHELON RIGHT
5 ROTOR DISCS
2 ROTOR DISCS
OPEN (Modified) DIAMOND
2 ROTOR DISCS
STAGGERED COLUMN LEFT
2 ROTOR DISCS
STAGGERED COLUMN RIGHT

FIGURE 12

the advice of the AMC in matters concerning employment of the aviation assets.[11]

The AMC and the ground commander flew together in the C+C aircraft toward the first landing zone (LZ). The C+C communicated with ground unit supporting artillery, and the FAC, as well as the aviation package, which at this time was en route to the first LZ. The Slicks had picked up the ground troops at a pick-up point during the time when the AMC and ground commander were conferring. The AMC was piloting the C+C helicopter, communicating with the lift element leader and giving him the location of a reporting point (RP) two or three miles away from the landing zone. The package was to orbit there while the C+C aircraft carried out the initial reconnaissance of the first landing zone.[12]

Deception was carried out by the C+C helicopter--it flew around the general area and circled many likely LZs, hoping to confuse any enemy who might be near. When the two commanders had taken a good look at the designated LZ, the C+C would call the lead lift helicopter pilot and order him to come ahead, or, if further information about the LZ were considered necessary, the AMC would call for a team of gunships to carry out low-level reconnaissance. After the reconnaissance was completed, or if none had been necessary, the officers in the C+C determined the desired touchdown point, the number of aircraft that could land at one time, what formation was to be used (Fig. 12),[13] headings and whether door guns of the lift helicopters were to be used to fire at likely enemy locations as they came in. Finally, the direction of

departure was passed on to the lift formation.[14/]

Because of the many likely LZs in the area, the AMC might call for a gunship fire team (two or three UH-1B/Cs or AH-1Gs) to mark the correct one with colored smoke. When the C+C verified the mark as correct, the lift flight leader identified it by the color of the smoke and the AMC issued verification.[15/]

Sometimes the two commanders decided to lay suppressive fire over the landing zone. If this were decided before the mission, the AMC directed a fire team to carry out a "deliberate" prestrike suppression. The fire team struck the area just before arrival of the lift element and then turned back taking up a trail position behind the troop carriers. From there, the fire team could cover the insertion and react to any enemy fire. If opposition developed during the lift approach, the C+C would order a "hasty" prestrike, while the lift element held back. The gunships struck any known or suspected enemy location. When this prestrike was completed, the gunships could continue suppressive fire around the LZ as directed by the C+C.[16/]

The critical times during the airmobile operation were during the insertion or during the extraction. The Slicks were exceedingly vulnerable as they slowly settled down ontc the LZ. The fire team remained close while the troops got off the helicopters and into defensive positions, or moved from the LZ. After the initial insertion, the lift element took off and returned to the pickup point to get the

AH-1G
FIGURE 13

remainder of the ground troops.[17]

The gunships normally stayed in the area with the C+C helicopter, covering the troops as they moved out from the LZ. As the lift element returned, the gunships met it and again escorted it into the LZ. Each step was carried out as had been done originally. When all of the ground troops were on the ground, the ground commander ordered the aviation package to a nearby standby area where they could land and shut off their engines. Here they were to wait until the ground unit searched the area around the LZ, or the ground commander could take the package to another pick-up point and insert a unit in another area. The knowledgeable ground commander would program his aviation assets so as to gain the most from them during his allotted time. He had the entire day's schedule worked out with each successive LZ planned ahead of time.[18]

A typical mission might have 27 sorties (one takeoff and landing by each aircraft) into the initial LZ. To the AMC, this meant that the package of nine Slicks would have to land there three times, and the LZ location was LZ-1, 2, and 3. According to some Army sources, the package might land and take off from 25 or 30 LZs daily if no contacts developed. Other sources said six or seven LZs per day were normal. If the enemy were encountered, the ground commander could "pile on," or bring enough of his units into the area to destroy the enemy. In the typical AO, however, the enemy was generally not much in evidence, and the original process was repeated on a continual day-to-day basis.[19]

This description was a normal day's operation of the AHC. Besides the tactical air movement of troops as shown by this example, the AHC could perform other missions, such as moving supplies, augmenting aeromedical evacuation units, performing search and rescue operations, and for use in any general support role.[20/]

[redacted]

CHAPTER III

ARMED HELICOPTERS

Three types of armed helicopter elements comprised the 12th Aviation Group: armed helicopter platoons organic to the Assault Helicopter Companies; the 334th Aviation Company; and the 3d Squadron, 17th Cavalry (Airmobile). Before discussing these elements further, this chapter profiles the 12th Group's two armed units--their use in supporting ground operations in III Corps. The significance of armed helicopter effectiveness in the Republic of Vietnam is brought to light, as are armed helicopter units' basic equipment, mission capability, and general employment considerations, even to the specific of helicopters as gun platforms.

The Machine and General Employment

Basic Equipment

Armed helicopter units were equipped with two basic vehicles, the UH-1B/C "Huey gunships" and the AH-1G Cobras. The Huey, a utility-type helicopter with armament subsystems installed, constituted the backbone of the armed helicopter fleet in RVN until early 1970.[1/]

Two primary armament subsystems used on the UH-1B/Cs were designated as the XM-21 and XM-156. The former consisted of an externally mounted 7.62 mini-gun and a seven-round rocket pod mounted on each side of the aircraft. This system was capable of a cyclic rate of fire of 2,400 rounds per minute (RPM) per mini-gun, increasing to 4,000 RPM on one gun when the other was stopped. The Huey carried 6,000 rounds for the

[redacted]

mini-guns and 14 rockets in the standard XM-21 load. The second subsystem, the XM-156, was a rocket ship configuration--19 rockets in a pod mounted on each side of the aircraft, for a total of 38 rounds per aircraft standard load.[2/] It also had a 40-mm grenade launcher in the nose of the helicopter. Additionally, the UH-1B/G gunships had M-60 machine-guns mounted in the cargo doors on each side of the aircraft--some Army aviators saw these M-60s as the Huey's advantage over the AH-1G Cobra. In other words, the Huey had four extra eyes and two extra guns to cover its vulnerable parts, down and to the sides and rear.[3/]

Attack helicopters, such as the Cobra, made their appearance during the war in RVN. The Cobra was designed specifically as a high-speed (compared to the Huey), two-place armed helicopter, possessing fully integrated weapons systems and external armament mounted on small wings on each side. It had as its primary subsystem, one mini-gun with a 2,000 to 4,000 RPM cyclic rate of fire, and a 40-mm grenade launcher (the XM-28 configuration). Additionally, each Cobra mounted XM-157 and XM-159 rocket pods on the stub wings protruding from the fuselage, with a 52-round 2.75-inch rocket capacity. The Cobra also was equipped with other weaponry from time to time, such as a 20-mm cannon, but the XM-28/XM-157/XM-159 was the most widely used combination of weapons subsystems.[4/]

Mission Capability and General Employment Considerations

Security missions were the basic function of armed helicopters, specifically, the escort of troop lift helicopter formations. In addition

to helicopter escort, however, the gunships had a wide variety of other security duties. They provided escort for surface movement, either troops sweeping through an area or vehicles carrying supplies and men along a road. They sometimes orbited above an Allied operation, giving it overhead cover. The gunships could also provide security by carrying out interdiction missions along enemy lines of communications (LOC).[5/]

Direct fire support missions were another capability of the armed helicopters. The gunships carried out preplanned strikes against various targets and LZs as necessary. Suppressive fire was direct fire support of troops and rescue activities, to hold enemy fire down to an acceptable level. The gunships also engaged targets of opportunity as tactical situations developed.[6/]

The third general classification of missions was reconnaissance. This could be done along specific routes or over wide areas of operation.[7/] The gunships were given an area and worked it without the assistance of ground troops. If they saw something suspicious, the gunships could descend and take a closer, more detailed look at the target. Their ability to trade punches with an enemy armed with individual weapons aided greatly in the survivability of the aircraft.

Due to terrain and climatic differences in various areas of RVN, armed units developed distinct techniques corresponding with the area of operation. Further, Army aviation planners made up a general list of guidelines which they believed would be comprehensive for all areas and

increase armed helicopter effectiveness. These were:[8/]

- Avoid flying in the "deadman's" zone. The "deadman's" zone was generally considered to be between 50 and 100 feet.
- Avoid overflying the target....An exception to the overflight consideration should be the high altitude (2,500 feet) steep attack angle (40 to 60 degrees) firing pass used by the AH-1G when a compact beaten zone was desired.
- Avoid flying in a trail position. Flying directly behind the lead aircraft, particularly at a low altitude, placed the trail ship in a very vulnerable position.
- Avoid flying parallel to terrain features. Normally, the enemy moves and bivouacs along tree lines and rivers.
- When possible, make a high reconnaissance.
- Always assume the area is hostile.
- Expend ammunition only upon worthwhile targets...the tactical situation could change quickly.
- Locate all friendly elements.
- Know the situation.
- Brief all elements involved.
- Take time.
- Adhere to the Rules of Engagement.

Armed helicopters nearly always were employed in teams of varying configuration. Experience had shown that two or more helicopters should work together, so they could support each other with fire if necessary. Also, one helicopter could report if the other were hit by enemy fire

and had gone down, and could assist in the rescue of the crew. Finally, the team concept allowed a certain division of labor: one gunship could navigate the team over the terrain, while its partner was down low searching for the enemy.[9/]

Configurations for the teams were many and varied. A light fire team (LFT) was made up of two armed helicopters, either UH-1B/Cs or AH-1Gs. A heavy fire team (HFT) consisted of three of the gunships. A Hunter/Killer (or Visual Reconnaissance) team, used mostly by the air cavalry units, was one AH-1G and an OH-6A scout. Another used by the air cavalry was the "White" team, or two light observation helicopters (LOH), used mainly for VR. If a helicopter unit possessed "people detection" equipment, called "Sniffer," the unit mounted the apparatus in a UH-1D/H or an OH-6 and sent it out with Cobra escort.[10/]

At night, armed units could be configured differently, varying from a single UH-1D/H with specially mounted sensor equipment to several Hueys with gunship escort, to fly varied missions.[11/]

Whether by day or night, Army doctrine allowed the armed units to try different variations and make up their own configurations. The units tried to tailor their teams to the AOs and threat. When any unit settled upon a method it considered effective, no requirement existed that other units do the same. As was stated by Army aviation officers who were interviewed pertaining to this report, there were few set ways of making up teams for armed operations, and higher aviation headquarters

did not interfere.[12]

Point and Area Fire

Army manuals categorized helicopter fire support into two types: point fire and area fire. Point fire was directed at a specific point or target with the intent to destroy. Two methods were used to engage point targets--diving fire and low-level fire. The former had the advantage of producing a small beaten zone but it exposed the aircraft to enemy fire for a longer period of time. Low-level fire, on the other hand, provided minimum exposure, as long as the enemy's troops were not strung out along the approaches to the target. However, in the case of low-level fire, the pilot and gunner had a limited amount of time to identify and engage the target, because they were almost on top of it before they saw it.[13]

Area fire required less acuuracy, for it was not directed at a specific point on the ground. Rather, it was carried out over a wide area. Area fire was used when the exact location of the enemy was not known, but his general position was considered within a relatively wide expanse. In this case, ordnance was liberally expended at likely looking terrain features throughout the suspect area. The helicopters could use any method, diving or low-level attack, at least until the enemy reacted and revealed his exact position. Then the gunships initiated point fire.[14]

Helicopter as a Weapons Platform

The UH-1B/Cs and the AH-1Gs were considered by the Army to be

especially agile and relatively stable gun platforms. Gunnery techniques were based primarily on a thorough knowledge of the weapons systems and the aircraft characteristics and peculiarities.

Aircraft crew training and proficiency were the basic factors in effective use of armed helicopters. The crew of the UH-1B/C consisted of an aircraft commander, a pilot, a crew-chief, and a gunner. The AC was the most experienced aviator aboard the aircraft, with a minimum of 300 flying hours in Vietnam. He had demonstrated superior judgment and ability in emergency situations, aircraft control, and basic flying techniques. The aviator was given an aircraft commander check ride by the unit Instructor Pilot (IP) and had to take a written examination--only after qualifying, was he then appointed as AC by his commanding officer. The pilot of the Huey was generally an aviator who had not accumulated enough hours to become an aircraft commander. The remainder of the crew, the crew-chief, and the gunner, were enlisted men who were responsible for daily maintenance and upkeep, and for firing the M-60 machine guns mounted in the doors of the Huey.[15/] (Army Huey pilots and ACs sometimes trained their enlisted personnel in basic flying techniques, unofficially, so they could bring the aircraft back in the event aviators were incapacitated.)[16/]

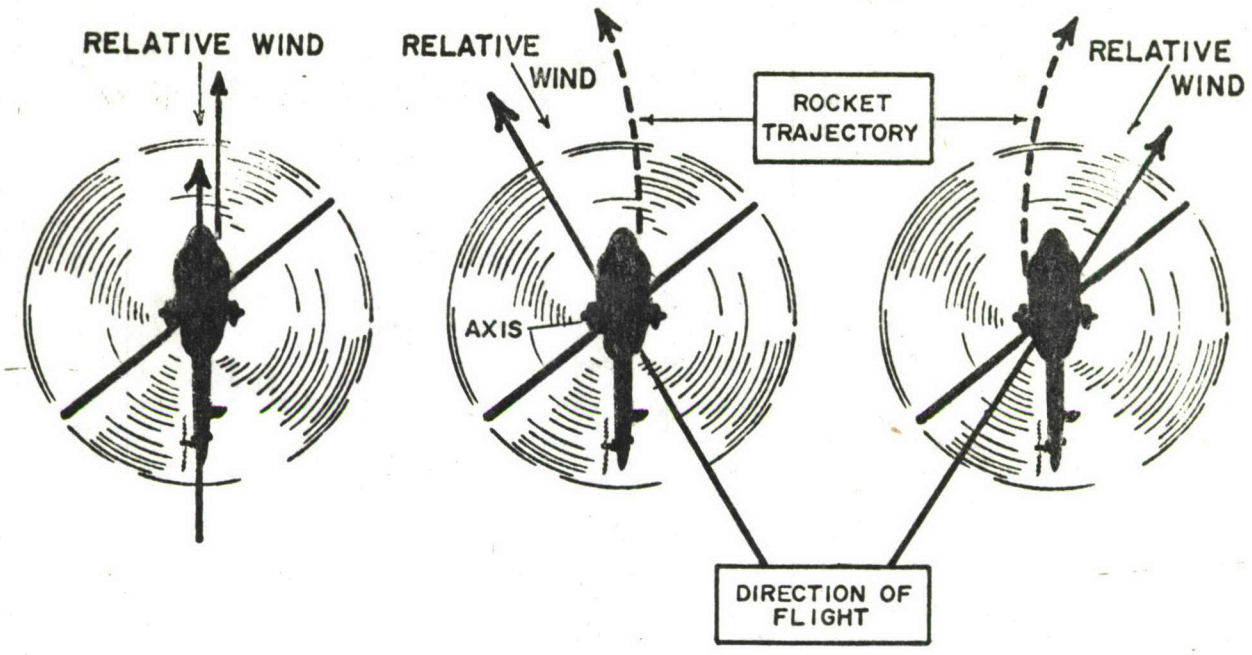
The AH-1G Cobra crew consisted of a pilot and copilot-gunner. In addition to normal flight schooling in the U.S. and in RVN, they received intensive instruction in air-to-ground gunnery, weapons characteristics, munitions, direct fire support, Rules of Engagement, and gunship support for airmobile operations. The copilot-gunner sat in the

front seat of the Cobra and operated the weapons systems, while the pilot sat in the back seat and flew the aircraft.[17/]

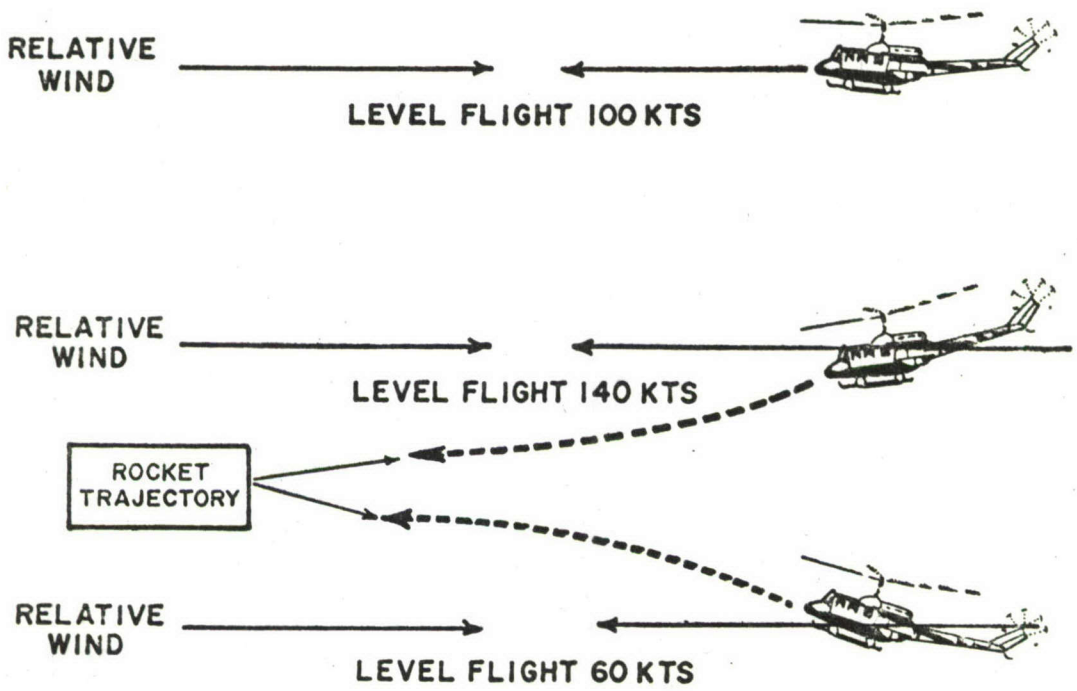
According to U.S. Army publications on helicopter gunnery, another important factor in accuracy was proper boresighting and zeroing of the weapon systems. Essentially, this involved making the axis of the sight and the bore of the weapons converge at the same point a fixed distance away. The process involved was mechanical and once completed, the aviator could maneuver his aircraft and fire with more assurance that the ordnance would strike the target because of boresighting. The peculiarities of the helicopter's maneuvering ability, however, added another consideration in ordnance delivery--that of a relative wind.[18/]

Relative wind (Fig. 14) had nothing to do with surface wind or wind drift. An Army manual called relative wind perhaps the single most important factor in helicopter rocket gunnery techniques; it was at the same time, the most misunderstood. It was produced by the movement of the aircraft through the air mass and was approximately the reverse of the direction of flight. The helicopter had the ability to sustain a horizontal flight course without the aircraft axis being aligned in the direction of its heading (in USAF terms, the angle produced by this attitude is "yaw"). If the gunship were not aligned into the relative wind, the rockets were not going to strike the intended target, because they tended to streamline into the relative wind.[19/]

In the vertical plane, helicopter gunnery was also affected by the



EFFECTS OF RELATIVE WIND ON ROCKET FLIGHT IN THE HORIZONTAL PLANE.



EFFECTS OF RELATIVE WIND ON ROCKET FLIGHT IN THE VERTICAL PLANE.

FIGURE 14

relative wind. Here the situation was a function of the aircraft's speed. The Huey, for example, flying level at 100 knots airspeed straight ahead in still air would have the relative wind coming directly from the front. Under the same conditions, at 60 knots, the helicopter had its nose up and tail down with the relative wind coming from below the aircraft. A rocket fired from this attitude would strike below the aiming point. At 140 knots, the reverse was true: the Huey's nose was down and its tail up, with the relative wind striking the top of the aircraft. A rocket fired in this attitude would streamline into the relative wind, and strike above the aiming point. The rocket pods were boresighted with the gunship's pitch at zero degrees. This meant that the ordnance would hit the target in the sight at the speed which allowed the aircraft to fly level, and if a relative wind condition were present, the rocket would streamline accordingly.[20/]

Range, altitude, and dive angle, rocket temperature, and surface wind had effects upon ordnance delivery for helicopters the same as for fixed-wing aircraft. An ideal firing situation; for example, might have been as follows: firing altitude 1,000 feet above the ground; no surface wind, 100 knots airspeed, rockets of the same temperature, weapons boresighted and zeroed at 750-1,000 meters, range 1,000 meters to the target--and no relative wind from an angle off the axis of the aircraft. Under these conditions, the aiming point would naturally be the target. But, as any of these changed, the aiming point would shift away from the target, and a thorough knowledge of all the variables was necessary for accurate helicopter fire.[21/]

There were guns in the cargo doors of Huey gunships and their machine guns were flexibly mounted on the airframe. The AH-1G had a flexible mini-gun system which could be traversed or elevated and lowered by the copilot-gunner in the front seat. He sat at a sighting station and operated a movable sight apparatus. The gun, mounted in a chin turret, followed the movement of the sight and once the target was acquired, the gunner could press the firing button with the knowledge that his weapon was on-target. The sighting station included a built-in lead compensator to assist the gunner.[22/]

Helicopter gunners were instructed to try to achieve hits on the first shots, but adjusted fire was the general rule. Some pilot gunners would aim short of the target and walk the rounds in, noting the hits on the ground. Others would fire directly at the target and then make corrective adjustments, either by moving the guns or by maneuvering the aircraft.[23/]

Armed Helicopter Units in III CTZ

Of significance are the 12th Aviation Group's two armed helicopter units: the 334th Aviation Company (Aerial Weapons) and the 3d Squadron, 17th Cavalry.

Aerial Weapons Company

The 145th Aviation Battalion, located at Bien Hoa Air Base, RVN, had three assault helicopter companies (AHCs) dedicated to corps support, two in a combat assault role and one carrying out administrative support

missions. The AHCs also furnished the Bien Hoa Tactical Area Command (BHTAC) two light fire teams daily equipped with Huey gunships. They flew reconnaissance over the Bien Hoa/Long Bien area at first and last light.[24/]

Aerial Weapons support for II FFV headquarters was provided by the battalion's 334th Aviation Company. It had three Armed Platoons of seven AH-1G Cobras each, plus maintenance and operations sections.[25/]

Units under II FFV received aerial weapons support from the 334th based upon allocations from the Army Aviation Element (AAE). Specific units such as the 3d Mobile Strike Force, the 75th Infantry (Rangers), and the Royal Thai Forces received dedicated support daily, but these missions changed frequently. The company also furnished gunship augmentation for AHCs when the need arose. These missions all came from the AAE through the Battalion Operations Center (BOC) and were passed on to the company. To obtain better coordination, a liaison officer was commissioned to serve with the ground unit supported, so that the ground commander could be advised of aviation capabilities.[26/]

A relatively constant requirement for the 334th was to provide alert emergency standby (ESB) fire teams each day. One light fire team (two Cobras) stood on five-minute alert at Bien Hoa. The other light fire team, also located at Bien Hoa, was on 30-minute alert, and served additionally as a back up for the five-minute team. The five-minute team stood alert from 0700 to 1900 hours daily, the 30-minute team from

[redacted]

0900 to 1900 hours. The 334th also kept a 30-minute team on alert at night, but it was seldom used. If the Army Aviation Element decided an additional team were required in an area in which contacts were taking place frequently, it would order the company to ready another team and send it to the area to stand by there, rather than have it remain where the other two teams were located.[27] The alert teams were considered to have a corps-wide capability, because the Army had approximately 35 locations throughout III Corps at which refueling and rearming were possible on a 24-hour basis. No area in III Corps was more than 30 minutes away from the alert pad by Cobra, so response times were considered excellent.[28]

Scramble missions came from the G-3. The battalion had scramble authority for the teams only in the event that one of its own aircraft went down. The notification for the scramble went from the Army Aviation Element to the Battalion Operations Center (BOC). As the information was being received, the BOC alerted the crews, which were located in an alert area called the "round table" near the flightline. When a horn sounded, three of the Cobra crewmen ran to their aircraft and prepared to take off. The fourth man contacted the BOC by a nearby telephone. He was given basic mission information--type (troops-in-contact, medevac cover, etc.), map coordinates, and call sign--and then he hurried to the waiting aircraft. At this time, the two Cobras took off for the target area.[29]

En route, the fire team obtained artillery clearances and specific data relative to the mission. Back at the alert pad, the 30-minute team

[redacted]

AIR CAVALRY SQUADRON

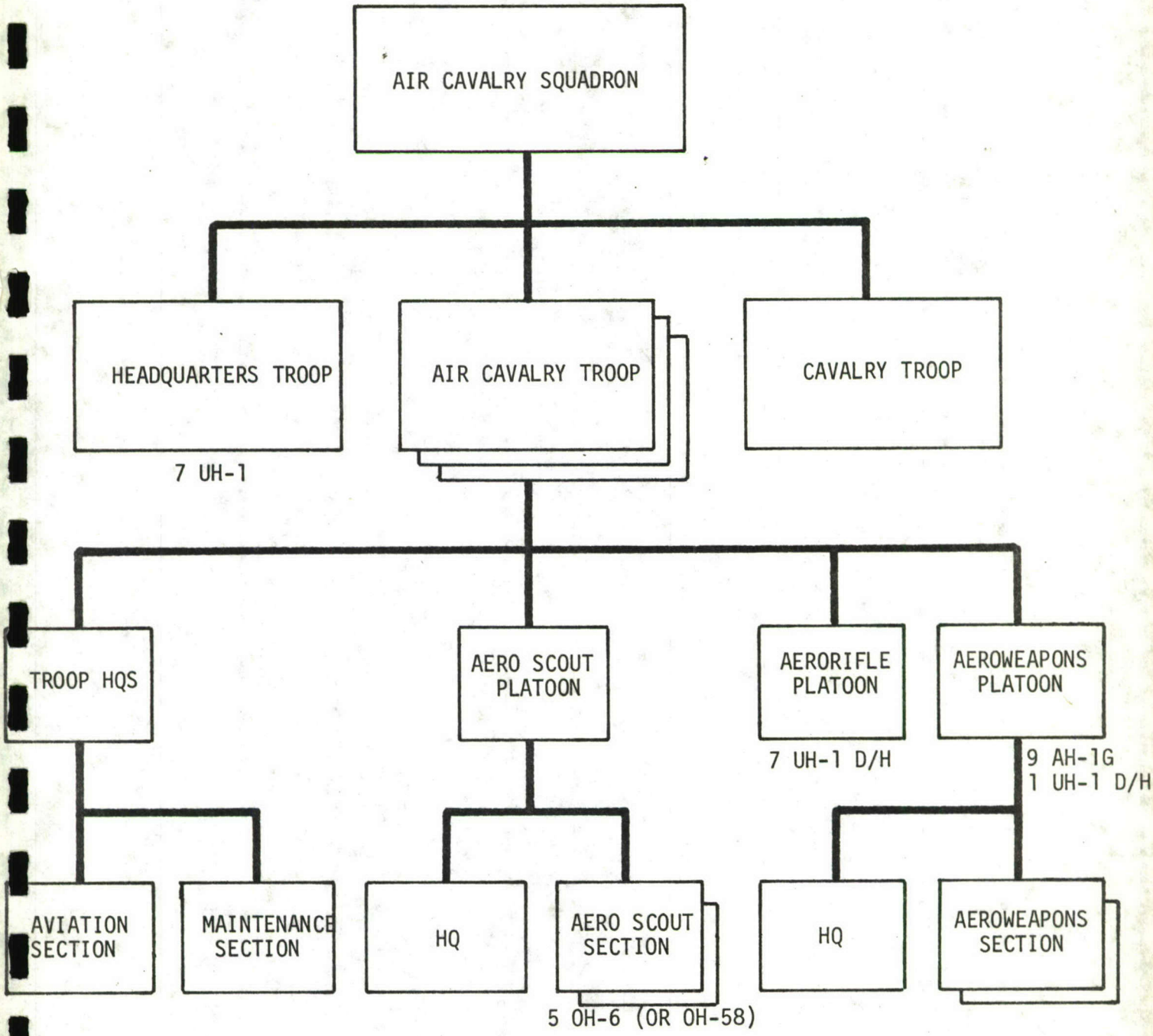


FIGURE 15

AIR CAVALRY BASE & SUPPORTED UNITS APR - MAY 1970

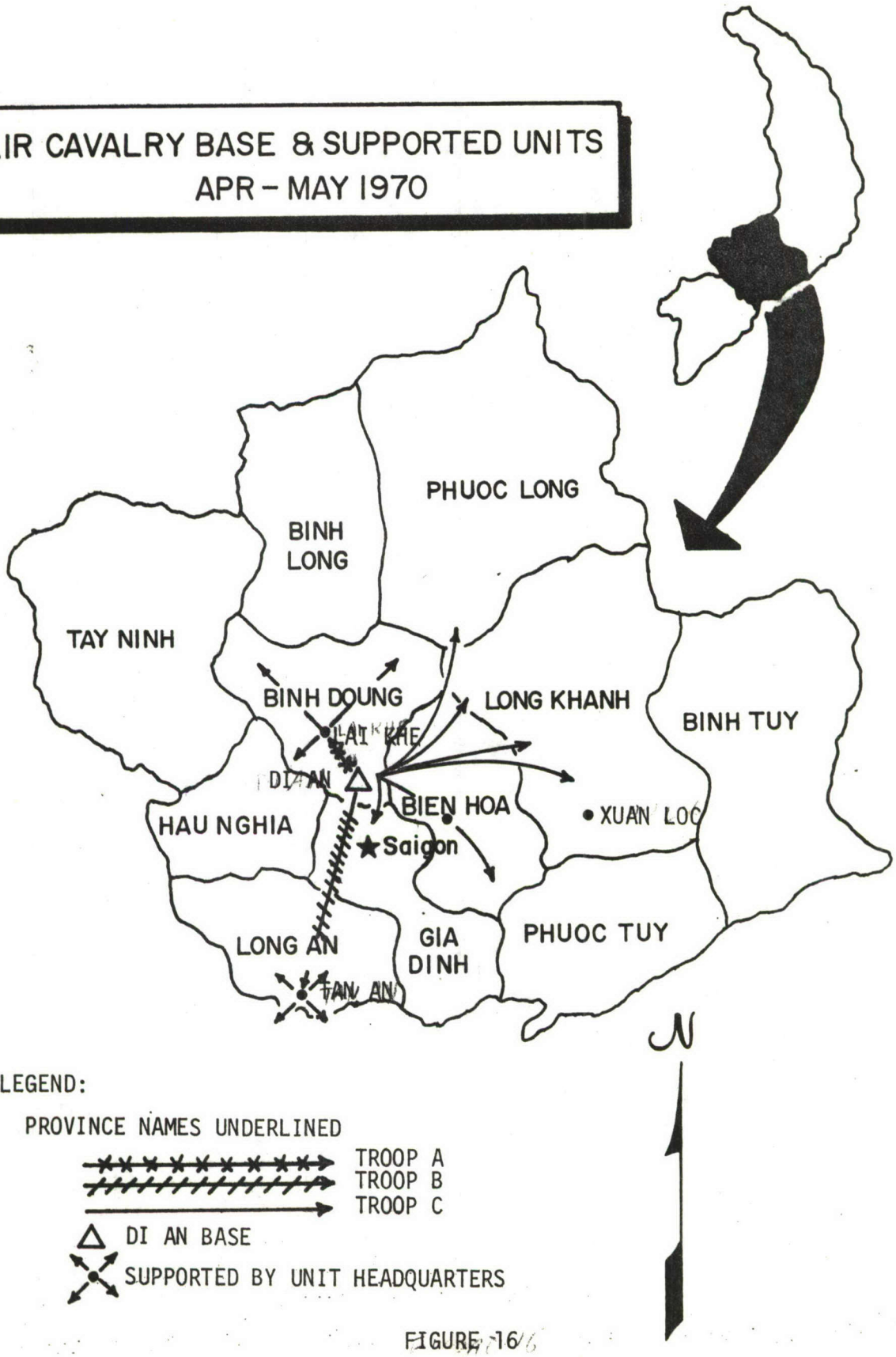


FIGURE 16

assumed the five-minute alert posture and the Aerial Weapons Company furnished another pair of Cobras to take its place as the 30-minute team.[30]

When the original two gunships arrived near the specified point they contacted the ground unit, a C+C helicopter in the area, or in many cases, a USAF forward air controller (FAC) on the scene. From these sources, they received the information to carry out the fire mission.[31]

On nearly all of these missions, the Cobras expended until they ran out of ammunition, at which time, they returned to base to refuel and rearm. Then the next five-minute team appeared at the point of contact, if required, and the whole procedure was repeated. According to one Army source, on certain days three or four alert teams would be working at the same time in different areas.[32]

Air Cavalry Squadron

The mission of the 12th Group's 3d Squadron, 17th Cavalry (Fig. 15) was to extend reconnaissance and security capabilities of units it supported by means of air. The 3d Squadron performed three general types of missions: reconnaissance; surveillance; and security.[33]

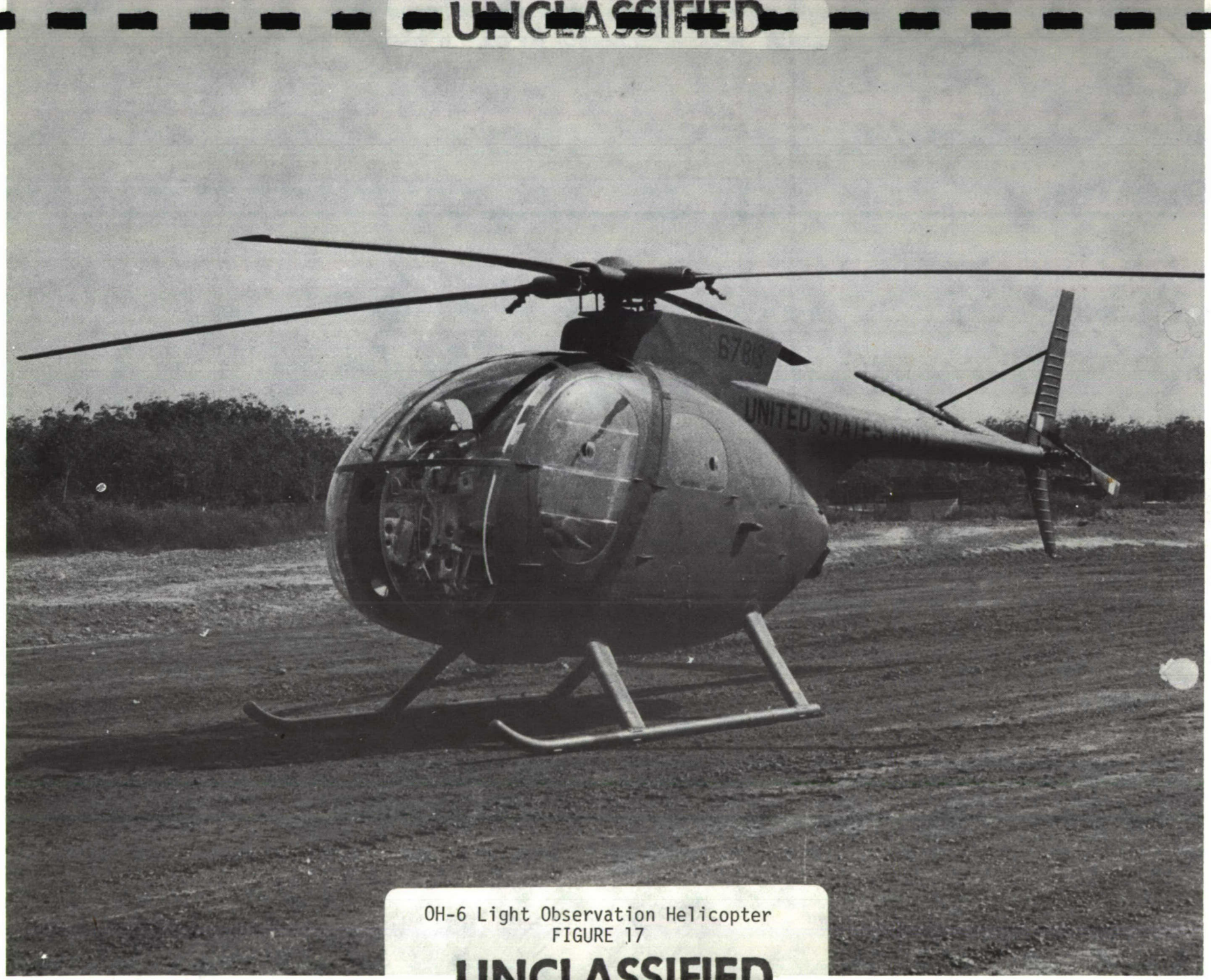
Di An, RVN (Fig. 16), was the home base of the unit. The squadron had a headquarters and headquarters troop, three air cavalry troops, and one normal cavalry troop which was equipped with wheeled ground vehicles. In addition to its basic TOE organization, the squadron had three

maintenance and three signal detachments to provide organic field maintenance, avionics, and electronics support.[34/]

Each air cavalry troop included a headquarters, an aero-scout platoon, an aero-weapons platoon, and an aero-rifle platoon (ARP). The ground troop had three cavalry platoons. The aero-scout platoons had ten OH-6A light observation helicopters (LOH). Troop C was evaluating a new LOH in early 1970--the OH-58--and possessed no OH-6As. The aero-weapons platoons were equipped with nine AH-1G Cobras. The ARPs had seven UH-1D/H Slicks and aero-riflemen.[35/]

Air cavalry troops had many capabilities. The main one used in III Corps was the conduct of extensive aerial and limited ground reconnaissance over a wide area. These were primarily conducted to find and fix the enemy's position. The troops could also screen and provide a security force for airmobile operations, although armed helicopters organic to AHCs normally performed this function. They could provide a highly mobile counterattack and pursuit force and, when suitably reinforced, could conduct semi-independent combat operations. Finally, and of interest to the Air Force, they could perform bomb damage assessment (BDA) and could "exploit the success of mass-destruction weapons including strategic bombardment."[36/]

Air cavalry unit operations were limited because they required a continuous resupply due to high ammunition and fuel expenditures. Periods of adverse weather affected and limited observation and firing techniques.



OH-6 Light Observation Helicopter
FIGURE 17

OH-58
FIGURE 18

Also, the air cavalry unit could not hold ground in an offensive operation and concurrently carry out other assigned missions of reconnaissance and security.[37] The first two of these limitations were general ones for air cavalry units and most other helicopter units as well. The third limitation was considered not too important, for Army commanders never required the air cavalry unit to hold a piece of ground for any significant length of time. Army doctrine called for reinforcement by conventional ground troops when the enemy was encountered and subsequent withdrawal of the helicopter unit.[38]

As explained in Chapter II, two of the three air cavalry troops from the squadron were dedicated to ground units on a "permanent" basis. Actually, permanent meant that each troop supported the same headquarters each day on an indefinite basis. This dedication could change, based upon need. If the CG II FFV and his staff decided to reassign the troops, they could do so. For example, during May, June, and July 1969, Troop A flew for the Capital Military Assistance Command (CMAC), Bien Hoa Tactical Area Command, and the Royal Thai Forces. Troop B supported the 3d Brigade, 9th Infantry Division (3/9 I.D.). Troop C supported six different headquarters.[39] Later, in January 1970, Troop A had assumed responsibility for three additional headquarters, while Troop C had only one of its former units. Troop B's assignment remained the same.[40] By April 1970, Troop A was supporting the ARVN's 5th Division only; Troop B had the 3/9th I.D. as before; and Troop C was OpCon to II FFV on a daily basis, providing air cavalry assets to from five to seven

ground units.[41]

Air cavalry units (and all Army aviation units) were considered by the Army officers to be most effective when under control of the supported headquarters. Also, Army doctrine called for an entire squadron to be under one headquarters and used as a single entity, if possible. In RVN, however, squadrons were not employed as complete units and the troops were assigned as shown in the preceding paragraph (the troops were OpCon to the division, brigade, or other headquarters). They were then virtually organic elements of the supported ground unit.[42]

Upon assignment, the troops sent a liaison element to the ground unit headquarters. This liaison was called by an Army publication "the most important factor to insure maximum troops utilization and successful mission accomplishment." In line with this idea, Troops A and B maintained a permanent liaison officer with ground headquarters supported by them on a continuing basis.[43]

Troop A had an LNO at Lai Khe, the headquarters of the ARVN 5th Division (Fig. 16). At 1730 hours daily, the division's staff presented a briefing of the day's activities to the ARVN's CG. He or his Deputy then decided which AOs would be worked the next day. As soon as the AOs were established, the LNO telephoned this information to the troop's operational center (TpOC) at Di An.[44] The standard daily commitment to the 5th Division was four Hunter/Killer teams. The Troop's Operations Officer matched the commitment with available aircraft and crews, and then posted specific information (who, what, when, where) on the troop's

mission board. This was done the evening before the missions were to be flown.[45/]

Two Hunter/Killer teams flew out to the areas of operation the next morning, arriving at first light. Shortly thereafter, the Aero Rifle Platoons (ARPs) went to a forward location near the AO from which they could react to sightings by the teams. They rode in UH-1D/Hs, one of which had a C+C capability.[46/]

As the Hunter/Killer (or VR) teams worked the AOs, they sent back spot reports, which were directed to division headquarters, the nearest ARVN battalion, and the TpOC at Di An. If a team considered information significant and worthy of closer inspection, the Cobra called the ARPs, giving the situation, location and other pertinent data. In effect, he scrambled the ARPs. The Slicks carrying the Aero Rifle Platoon came to the scene and inserted aero riflemen who proceeded to sweep the area. The Slicks took off and circled overhead, returned to their original location, or, if necessary, went to the nearest ARVN battalion and picked up a ready reaction force. Each ground unit was required to keep a ready reaction force on alert while the teams worked their area.[47/]

If the ARPs made contact, the ready reaction force was brought into the area. The ARPs had done their job--they had found the enemy and developed a situation for the ground unit to exploit. The ARPs returned to their original stand by area and the VR teams furnished support to the ready reaction force or searched elsewhere for the enemy.[48/]

[redacted]

This process was continually carried on throughout the day, week after week. However, if Troop A's whole area got "hot" and experienced many of these contacts, the team commitment was raised. Pilots could be borrowed from the troop's administrative elements to put together additional crews. The troop could also change the configuration of the teams to provide extra support. Instead of one Cobra and one LOH per team, the troop's commander could order an additional Cobra to go along to each AO. These measures were surge capabilities and could not be sustained indefinitely.[49]

After they had spent six hours in the supported unit's AO, the original two VR teams returned to Di An. The other two VR teams went out to the AOs and continued the missions. The latter stayed until dark and then returned. In the meantime, the liaison officer received the next day's AOs and passed them to the TpOC, recycling the operation. Troop A had other missions infrequently, such as a team to cover ROME PLOW operations to the east of Xuan Loc, but its major concern was the four Hunter/Killer teams and the ARP for the ARVN 5th Division.[50]

Troop B supported the 3d Brigade of the U.S. 9th Infantry Division in Long An Province (Fig. 16). It gave the ground unit three Hunter/Killer teams during daylight hours as a standard commitment. The troop had an LNO stationed at the brigade headquarters at Tan An, who received the AOs from the S-3 at 1600 hours the day before the missions were to be flown. Each day the LNO called the information needed for the next day down to the Troop B TpOC at Di An, where the data were posted on a

[redacted]

[redacted]

mission board.[51]

The troop's operations were different from Troop A's. Normally, one VR team was sent to the brigade headquarters at 0700 hours, where it stood standby alert until 1900 hours each day. It could be used to CAP an area during an airmobile assault. If a ground element were contacted, the team was sent out to examine nearby waterways, because the enemy was likely to "head for the water" as he attempted to escape.[52]

The other Hunter/Killer teams and the ARPs were sent to the brigade headquarters at 0900 to 0930 hours, and at 1300 to 1330 hours. The teams did not know which AOs they would work during the day, since the mission notification from brigade to the troop did not include specific data about employment. As the teams flew to brigade headquarters, they were required to radio the LNO when they had reached a point halfway between Di An and Tan An. He then furnished specifics, advising them to go to an AO and VR, or arrive at headquarters for a detailed briefing for a special mission, or perhaps fly to certain map coordinates and cover an airmobile insertion.[53]

After the teams arrived in the AOs, they began the VR missions. If they found something significant, the crew of the Cobra radioed the information to the LNO. In Troop B's case, he had the authority to scramble the Aero Rifle Platoon. If the LNO decided to commit and insert the ARP, he informed the brigade S-3 who alerted a ground company

[redacted]

to be ready in the event the ARP made contact and needed reinforcing.[54]

A C+C helicopter was sent along to cover the insertion. Its pilot made the decision to call for the ready reaction company. Normally, the brigade commander went along to the area and orbited above the insertion. He observed but did not take part unless the contact developed into a major fight. At any rate, if the ARP became engaged, a "Pile-on" was initiated and the ARP was withdrawn. The ARP returned to standby and the VR teams either stayed to help the ground forces or assumed new AOs.[55]

Troop B's last team from the daily standard commitment was not actually a team, for it consisted of a single Cobra. It went to brigade headquarters just before dark, and was teamed with a UH-1B/H from the brigade's Aviation Section. The Slick was equipped with a searchlight and night observation devices (NODs). The two helicopters flew what they called "Night Hunter" missions, reacting to enemy activity throughout the brigade AO. The brigade also ran a "Night Hawk" mission, which was a single UH-1D/H equipped with a Xenon searchlight, night observation device, and a mini-gun. It went out to an AO and flew along with the searchlight on. If the Huey observed anything, it obtained clearance and engaged. Sometimes Troop B's night Cobra covered the Night Hawk.[56]

Troop B's operations in support of the brigade revealed the flexibility of air cavalry employment. In addition to VR teams, it employed the white teams (two LOHs), or it varied the composition of the teams--two

LOHs and one Cobra, two Cobras and one LOH--based upon the number of aircraft available in each type, and crew status. The troop's use of its ARP also was inherently flexible--it sent the ARP to the brigade on a two-day-on and one-day-off-basis. On the off-day, the troop borrowed a platoon from Troop D, 17th Cavalry, to take the place of the organic aero riflemen.[57/]

The operations of Troop C were peculiar to the squadron as it supported a number of different headquarters. Because of this, it maintained a close relationship with the Army Aviation Element at II FFV headquarters. The AAE decided which ground headquarters would receive support on a given day, and sent this information to the troop four or five days in advance. This allowed the troop to contact the supported unit before the missions were flown and initiate a degree of coordination between the two units which would aid in mission effectiveness.[58/]

Missions were sent down through the squadron's operation center to the troop. The day before the scheduled missions, the troop called the operations center and confirmed the commitment, and then contacted the specified ground unit in its AO.[59/]

Troop C was required to furnish the standard four Hunter/Killer teams per day, plus the ARPs. Usually, it sent a C+C Huey to the supported headquarters one-half hour before arrival of the first team and before the ARPs. The C+C carried the LNO who helped the headquarters plan the day's missions.[60/]

Two VR teams normally arrived at the ground unit's area at 0700 hours. Ideally, the first missions and AOs had been planned by the LNO and the ground commander. The AOs were given to the teams in map coordinates, spaced closely, and sometimes overlapping. The ARP could then be placed at a nearby fire support base, reducing reaction time in the event of its need. Troop C sometimes sent a maintenance team along with the ARP--one avionics specialist, and a Cobra crew chief--to provide on-the-spot first echelon maintenance if needed.[61]

Two additional visual reconnaissance teams normally flew to the ground unit's area about 0800 to 0900 hours to receive specific areas of operation from the liaison officer. Employment of teams was generally determined by the LNO and the ground troop commander, however, the commander did not request specific team configurations. When the commander was unfamiliar with the teams' makeup and their capabilities, the LNO's task became one of basic education of the ground unit. After working together with the units a few times, the process became smoother--similar to that of the other two air cavalry troops and their supported units.[62]

As the day's missions were carried out, occasions often arose which demonstrated an additional flexibility of air cavalry units. If the situation in an AO changed, the C+C Huey could reconfigure the helicopter teams without informing the ground commander. The troop could make up seven or eight different modified teams as it went along, without reporting to anyone.[63]

Situation and spot reports, however, were radioed to the ground unit headquarters, to the TpOC at Di An, and to the C+C helicopter, if it were not in the area. The C+C could commit the Aero Rifle Platoon and the ground commander made the decisions necessary to follow up any sightings or contacts. If the ARP developed a contact, the ground commanders sent the ready reaction force and the ARP was withdrawn.[64/]

Troop C had to maintain a close relationship with its supported units, and the fact that it supported many units made this factor more critical. These cases of Troops A, B, and C were prime examples of the U.S. method of supporting ground units. According to Army sources, aviation then became "organic" to the ground force in a real sense, and was more responsive to the tactical considerations than it would have been when operating by any different method. All U.S. Army officers, aviators, and ground personnel interviewed in association with this report stressed this opinion strongly.[65/]

Armed Helicopter Effectiveness

To examine effectiveness of armed helicopter operations, the U.S. Army, Vietnam, Aviation Office, conducted a country-wide study in June 1969, which scrutinized various aspects of gunship operations, including force structure and results obtained through Corps Tactical Zone by Corps Tactical Zone comparison. Certain Army officers were also interrogated regarding comparisons of the armed helicopter to tactical aircraft. Further, various questions were posed Army Aviation personnel in III CTZ:

. Are armed helicopters responsive to needs of ground commanders?

. Can they work safely in proximity to friendly troops?

. Can they work in bad weather conditions?

A brief summary of the USARV study follows, along with results of the three-point investigation, and commentaries of Army officers familiar with effectiveness of armed helicopters versus tactical aircraft.

USARV Study

The U.S. Army, Vietnam, Aviation Office study covered the period from February 1968 to April 1969. A total of 703 armed helicopters were authorized for USARV in June 1969, but the average monthly on-hand figure of armed helicopters--UH-1B/C Hueys and AH-1G Cobras--was 641 for the period. Beginning in February, the number of AH-1Gs increased and the UH-1B/Cs declined, so that by June 1969, Cobras comprised 34 percent of the gunship fleet and Hueys, 66 percent.[66/]

Gunship employment by sorties or aircraft flights for the Huey was 27 minutes and the Cobra 37 minutes per flight. The difference was attributed to the Cobra's added ordnance--carrying capability. It could carry 75 percent more than the Huey per average sortie, or 1,750 pounds versus 1,000 pounds.[67/]

During the reporting period, 49 Cobras and 150 Huey gunships were lost while conducting operations against the enemy, for an average of one armed helicopter every 5,700 sorties. (The study cited an analysis

[redacted]

by the Directorate of Operations, DCS/Plans and Operations, Hq USAF, in April 1969 which showed USAF losses at one "attack" or reconnaissance aircraft per 3,000 sorties.[68/] The USARV document stated that the USAF figure was for aircraft performing attack (close and tactical air support and interdiction) and reconnaissance missions. An armed helicopter recorded a sortie each time it either landed or hovered to approximate landing. USAF tactical aircraft logged a sortie for each flight--take off and landing. The difference was significant. A helicopter might take off and land (or hover in lieu of landing) several times in a single mission and each would be a sortie. A USAF aircraft, on the other hand, flew much longer missions and made only one takeoff and landing during the time--hence considerably fewer sorties per mission or hours of flying time.

Enemy personnel and materiel losses to armed helicopters indicated the influence of the supported unit mission, the enemy, and the terrain. Two-thirds of the airmobile divisions' gunships performed escort and aerial rocket artillery missions. They had meager reported results, because they were so closely allied with the ground units that the KBA could not be separated from the enemy killed by the ground units' organic weapons. A comparison between II CTZ and IV CTZ reflected the influence of terrain. The combination of high enemy activity and flat terrain in IV CTZ produced 475 enemy KBA to each gunship lost according to Army statements. In II CTZ, the ratio was 92 to 1, due to the rougher terrain and fewer enemy encountered. The country-wide nondivisional average was 199 KBA for each gunship lost.[69/]

[redacted]

Overall, the Cobra inflicted more damage upon the enemy than did the Huey, because of the differences in capability mentioned in Chapter II. It killed 44 percent more enemy, destroyed 83 percent more structures, and more than 100 percent more sampans per sortie. From February 1968 to April 1969, the gunship fleet had just two percent of the USARV personnel assigned in RVN, but it accounted for 25.8 percent of the enemy killed by U.S. Forces and 13.8 percent of the enemy killed by all friendly units.[70/]

According to the USARV study, during an average day, gunships flew 2,487 sorties or 1,229 hours. (Blade hours were not mentioned.) They expended 480,000 rounds of 7.62-mm ammunition, 4,970 2.75-inch rockets, and 5,324 rounds of 40-mm grenade ammunition. The armed helicopters killed 73 enemy troops per day, destroying and damaging 132 structures and 48 sampans. Every two and one-half days, one armed helicopter was lost.[71/]

Dedication, Proximity to Friendly Troops, and Weather

The first question--Are armed helicopters responsive to the needs of the ground commander?--has been largely answered earlier in this chapter. Army officers said that aviation assets should be directly under the ground commander on a dedicated basis. Army doctrine viewed the helicopter as an element the commander had to use as he saw fit for a specified time. The Army officers believed the helicopter employed in such a manner was closer in distance and time to the action,

and was rapidly responsive to the tactical situation.[72]

> *"...It is another asset that the ground commander can use to influence the battle. The key element here is that aviation is under the direct control of the ground commander--it's his. In other kinds of support, the tactical commander requests and some higher headquarters approves or disapproves. Once the ground unit gets the Army aviation, by TOE or by dedication, that's it. Anything the ground commander has like that is most responsive...."*

The helicopters used under the dedication cited are in the hands of the ground tactical commander before a situation arises where they are needed. They are already in the AO and are working at a nearby location. There is no need to call them from somewhere far away. Only in the case of the employment of the aerial weapons companies does Army aviation go through a process similar to the USAF immediate air request system, where outside aircraft are called in to support a given unit. And in these instances the unit has no dedicated aviation assets already under its control.

Cobra pilots repeatedly stressed their capability of placing ordnance where the ground unit wanted it. They said they were firing closer to the target and at a lower speed than fixed-wing aircraft. The Cobras had a flexible weapons system with one man using it to the exclusion of other duties, while the pilot concentrated on flying the aircraft and firing the rockets.[73]

Ordnance itself was another factor. The armed helicopter carried only rockets, grenades, and machine guns. The bursting radius for the

40-mm grenade ammunition was five meters, and the 2.75-inch rocket warheads covered no more than 15 meters. Therefore, the gunship pilots were not as restricted in delivering the ordnance as in instances with heavier weapons. When heavier ordnance was required, the aviation officers were quick to point out that the ground commander could call for tactical airpower.[74/]

When pressed on how close to friendly troops they would strike, Army pilots were hesitant. If the ground commander requested, and accepted the responsibility, the gunship would fire anywhere. Normally, ordnance could be expended as near as 25 meters to friendlies, if they were lying down. In some cases, the gunships fired as close as five meters--but only if the Allied troops were protected and the tactical situation warranted it. Again, the basic responsibility rested with the ground commander--he made the decision as to where the fire would be directed.[75/]

The Army appeared to be ready to accept a certain number of Short Round incidents because of the positive effects that the armed helicopters had. The Army officers did not say this specifically in those terms, but the implication was clear. Further, although no figures were available on Short Rounds, aviation officials stated incidents were rare when compared to the amount of ordnance expended.

Short Rounds, however, did occur, and news media reported these incidents periodically. In one case, ground commander in I Corps ordered armed helicopters out of his AO after they had struck his unit twice in

one day--once hitting the battalion command post. When asked about such incidents, Army aviators gave a number of possibilities:[76]

- The ground unit did not identify its position correctly.
- Ground troops failed to take cover properly or wanted to watch the airstrike.
- Ground units did not always know the location of all of their elements.
- Ordnance was faulty, with rocket fins bent, etc.
- The ordnance bounced off ground obstructions or trees.
- The helicopters used faulty gunnery techniques.

Considering the amount of ordnance expended and the number of variables involved, the Army considered the Short Round record good. As the Commanding Officer of the 12th Aviation Group commented: "You can work effectively for a year and nothing bad will happen...Then one day, there is that one damn bad rocket...."[77]

Weather was the final point investigated. In zero-ceiling and zero-visibility conditions, armed helicopters could not operate. The crew had to see the target. Helicopter gunships were not equipped with a capability to deliver ordnance through cloud or heavy haze. As long as there were 500-1,000-foot ceilings or visibility, the gunship pilots could acquire the target and deliver ordnance. Cobras were most effective if the firing passes began at 1,500 feet or above, with target engagement at between 500 and 1,500 feet. The UH-1B/C gunships operated better at a lower level. At any rate, poor weather drove the gunships

[redacted]

to a lower level as it limited the crew's ability to acquire the target visually. When the gunships were at the lower level, they were more vulnerable to enemy ground fire. Again, as the Army aviators stated, the limitations had the overall effect of lessening their support capability, but unless an area were completely closed in, they could furnish some armed helicopter support to the ground commander.[78/]

Tactical Air Versus Armed Helicopters

Army commanders considered the armed helicopters to be more "responsive" to their day-to-day tactical requirements than USAF tactical fighters. Army opinions on specific advantages inherent in its system and the characteristics of the helicopter have been discussed in previous chapters. The term "responsive" did not mean the speed with which an aircraft could go from one location to another. Rather, it meant the vehicle was available for use by the ground commander on a continuing basis, and as close to his unit as possible. The Army commanders considered armed helicopters, employed by its system, dedicated to a tactical unit and available for six hours of blade-time per day, met its needs for fire in most cases.[79/]

Army officers stated that armed helicopters should not get into a "spitting contest" with enemy antiaircraft weapons. They reiterated the primary mission of armed helicopters was the escort of lift elements, with close fire support (CFS) as a peripheral mission. (The officers used close fire support instead of close air support.) No one defired

[redacted]

how close CFS actually was. They were reluctant to be drawn into a comparison of close air support (CAS) by USAF tactical fighters versus CFS by the gunships, with statements to the effect that it was as if one were trying to compare "apples and oranges."[80/] Further, they asked, "How could someone compare a 750-pound bomb or napalm with a 2.75-inch rocket?"[81/]

In the general sense, the Army commanders saw the tactical aircraft and gunships as having their own place in an escalation of effort. First, the ground commander employed his unit's rifles, machine guns, and mortars. Then he called for artillery and gunships. Finally, he requested tactical airstrikes. The ground commander could vary this somewhat, based upon his estimate of the enemy situation. If the enemy was thought to be in hard fortifications beyond the capability of organic weapons and helicopter armament, he called for tactical air first. He could also request fighters if the enemy appeared to be present in enough numbers to justify ordnance over a relatively large area, or if the enemy had heavy antiaircraft weapons.[82/] Some of the officers interviewed suggested that a statistical picture of the ground commanders' use of all assets could be obtained if a study were made comparing the number of small unit actions with the instances of requests for artillery and tactical air support, and the use of armed gunships. This, however, constituted a project of major proportions beyond the scope of this report.

[redacted]

Rather than tactical air support versus helicopter gunships, Army officers believed it was actually tactical fighters and gunships. In other words, the two weapons systems complemented each other.[83] The officers reflected a view once summed up by Gen. William C. Westmoreland, MACV Commander, as he testified before a congressional committee. He was referring to support provided by an Air Force aircraft, the A-X, a planned tactical fighter exemplifying future CAS needs in the USAF concept, and the Army's AH-56 Cheyenne, a follow-on attack helicopter to the AH-1G Cobra:[84]

> *"I feel that the two systems complement each other. Both are required. Generally, the AH-56 will deliver fire along the front line, the flanks, and within the battle position where a premium is attached to quick response, night and adverse weather capability, and a high degree of accuracy...."*
>
> *"The A-X will perform those missions requiring penetration over a hostile environment to deliver heavier munitions against less fleeting targets. There will be some overlap, but this is true for all weapons. I believe the overlap will be small and desirable...."*

The desirability of the overlap was noted by the Commanding Officer of the 12th CAG, who stated that if it existed, it meant there was no gap in overall support. This was viewed as very important, because Army commanders believed they needed firepower throughout the entire tactical spectrum.[85]

Another factor was involved when considering the overlap. Army officers conceded that helicopters were vulnerable. The appearance of heavy caliber antiaircraft weapons or small portable antiaircraft missiles in the enemy's arsenal might render the armed gunships

[redacted]

ineffective because of heavy losses. Under such circumstances, tactical air would be the only means of close-in support. The tactical fighter was faster and harder to hit. They were built heavier than helicopters and possessed a redundancy of systems. They could survive in a more hostile environment than could helicopters and could operate where helicopter gunships could not go.

Army officers also recognized the superiority of the tactical fighter's ordnance-carrying capability. The fighter was designed to offer a wide variety of weapons--machine guns, cannon, bombs weighing thousands of pounds, area-denial weapons, napalm, and the like. The armed helicopter had no such capability, but its mission of escort for troop lifts and limited suppressive fire did not require all of the weapons carried on the tactical fighter.

Both systems were to be present when their services were needed; the gunship on a dedicated, semipermanent basis, and tactical airpower on an "on-call" basis. Army officers saw the gunship as a light close fire support (CFS) vehicle carrying out missions as an element of the ground force. The tactical fighter, on the other hand, was viewed as a heavy close air support (CAS) aircraft which was capable of furnishing support far beyond the organic weapons role.

The Army officers interviewed considered the controversy between exponents of the A-X and the AH-56 as unnecessary, because the missions and capability of each were so different. They said that lessons learned in RVN proved this. To a man, they called for the development of both.

The lower-level army officers saw a danger if either of the systems won out to the exclusion of the other. They believed the result might be "tragic." Whichever one were chosen, the overall effect would be a reduction in combat power--and an increase in the number of casualties to friendly troops--always to be avoided.[86/]

[redacted]

CHAPTER IV

SURVEILLANCE AND RECONNAISSANCE SUPPORT

According to the U.S. Army definition, surveillance was the systematic observation of airspace, surface, or subsurface areas, places, or things, by visual, electronic, photographic, or other means for intelligence purposes. A surveillance mission was characterized by the great expanse of terrain that it covered and the repetition with which it was flown. Reconnaissance was a mission to obtain, by visual or other detection methods, information about the activities and resources of an enemy or potential enemy. A reconnaissance mission was directed toward one or more specific target areas without the requirement for continuous coverage.[1/] Comparatively speaking, surveillance was formal and continuous, using highly sophisticated equipment; reconnaissance was more informal and target-oriented.

Both aerial surveillance and reconnaissance missions were classified as either preplanned or immediate. Nearly all were of the first category based upon anticipated requirements for intelligence information. Immediates responded to unforeseen requirements and were characterized by urgency of time involved between request for and receipt of the information.

Surveillance

The 73d Aviation Company (Surveillance Airplane) was assigned to the 12th CAG's 210th Aviation Battalion and provided the surveillance

[redacted]

aircraft to the II FFV G-2. As opposed to other types of aviation support discussed in this report, surveillance and reconnaissance assets were under the II FFV G-2 Intelligence, rather than under G-3 Operations.[2/]

The primary surveillance aircraft was the OV-1 Mohawk. This twin-engine, two-place aircraft was configured with one of three highly sophisticated surveillance systems: cameras, side-looking airborne radar, or infrared. The Photographic system was installed in the OV-1A. Each of these aircraft had a KA-30 belly camera and a KA-60 camera in the nose. The KA-30 had the capability of taking vertical and oblique pictures, while the KA-60 provided a panoramic 180-degree coverage of targets to the front of the OV-1A. Three different types of film were available for the KA-30--black and white, color, and camouflage-detection. The 73d Company had the capability to process the first two types, but the latter had to be sent to the USAF laboratory at Tan Son Nhut Air Base. This decreased its usefulness because of the time lost in shipping the film and waiting for its return.[3/]

OV-1B aircraft had SLAR capability. The SLAR equipment emitted pulses that bounced off objects and terrain features and returned to a receiver in the aircraft. The return was converted into a visual presentation and transferred to film which proceeded through a high-speed developing process in the aircraft. In about three minutes, the film rolled over a viewer operated by the OV-1B observer, who looked for black dots which meant that targets had been detected. These could be called in to the supported headquarters or to II FFV as near-real time information.[4/]

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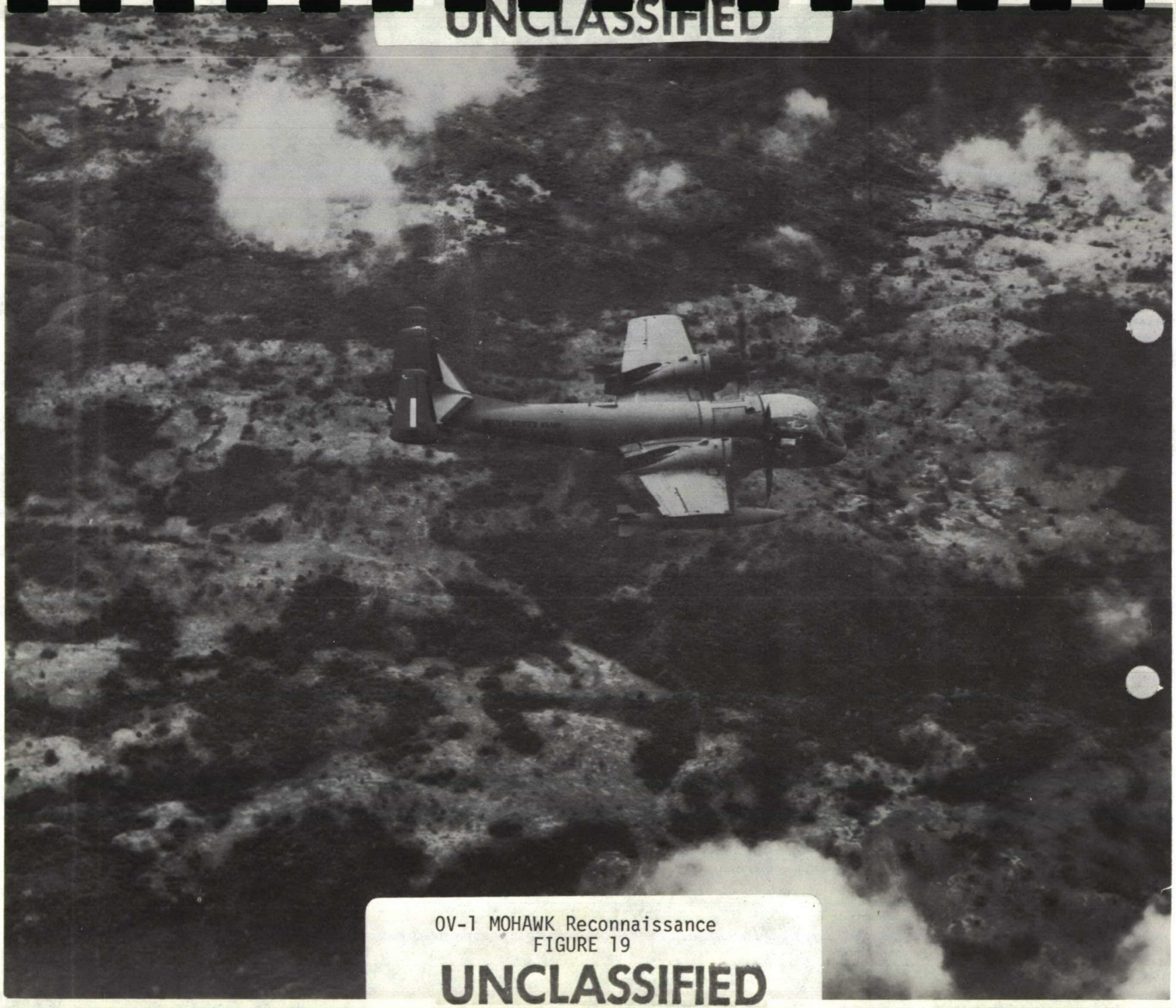


OV-1 MOHAWK Reconnaissance
FIGURE 19

UNCLASSIFIED

[redacted]

Red Haze coverage, or infrared, was provided by the 73d Aviation Company's OV-1Cs. Infrared detectors mounted in the aircraft produced detailed imagery by sensing temperature variations in the terrain and objects on the ground. This was a passive detection device, emitting no impulses that could be detected by an enemy. The heat differences were printed on film in the aircraft. Although the film could not be viewed in the aircraft as was the case with SLAR, a real time visual presentation was provided to the aircraft observer on a Red Haze scope. Again, targets developed by the observer could be radioed to the supported unit headquarters or to II FFV.[5/]

Photo, SLAR, and Red Haze film could be processed at the 73d Aviation Company's base at Long Thanh North, not far from Long Binh Post. SLAR and Red Haze imagery could also be processed at the supported unit headquarters. The 3d Brigade, 9th Infantry Division, at Tan An had a SLAR processing apparatus. The 25th Infantry Division at Cu Chi, the 1st Cavalry Division at Phouc Vinh, and the 199th Infantry Brigade at Xuan Loc each had equipment that could handle both SLAR and Red Haze film. The OV-1s did not need to land at the locations and transfer the film to the facilities. Rather, a data link terminal was included with the equipment, and as the aircraft flew missions in the AOs, they automatically sent the SLAR and Red Haze responses to the terminal. There, an observer viewed the imagery and the data were recorded on film, just as was the case in the aircraft cockpit. According to one Army officer, sometimes the imagery received at the data terminal was inexplicibly

[redacted]

better than that recorded in the aircraft and processed at Long Thanh North. If either observer thought he detected a lucrative target, the information was sent to the various operations. The films were later given to unit intelligence sections for more detailed analyses, and for inclusion in permanent records.[6/]

All three sensors were considered most effective when used in conjunction with the other. The SLAR aircraft normally flew missions during the hours of darkness. After SLAR imagery analysis, Red Haze coverage was flown to further identify targets that appeared. Finally, the photo aircraft were sent to visually scan and photograph the area. If the three methods of checking confirmed the targets, they were considered valid beyond question. The II FFV G-2 used results of the three systems over long periods to try to establish patterns of enemy activity.[7/]

Specific missions for all OV-1s were normally fragged by II FFV G-2, based upon requests from units and depending on aircraft availability. During early 1970, the 73d Aviation Company was committed to fly between 13 and 15 missions every 24 hours. Three OV-1B SLAR missions were scheduled each night along the Cambodian Border, usually three hours apart. Eight Red Haze missions were scheduled daily, over ten kilometer square blocks. Each OV-1C covered six of these blocks per mission. Red Haze flights covered the entire III CTZ at least once every four or five days. Finally, OV-1As flew two photo-VR missions daily under control of the supported headquarters and against high-priority targets. These aircraft went to the ground unit

headquarters prior to the mission. The crews received detailed instructions from the intelligence officers. Then, the OV-1A flew the mission and returned to the ground unit where the crew briefed the G-2 on visual results. Films were given to the G-2 Section, which processed them and disseminated the finished photos.[8]

The three systems all had limitations which affected the use of specific missions in certain situations. Photography obviously could not be used in very bad weather. SLAR was ineffective under severe weather conditions, but could achieve worthwhile results in marginal weather. Red Haze also was not an all-weather system, for the aircraft had to fly beneath cloud levels to obtain the infrared emissions.[9]

Terrain was also a consideration. SLAR detected vehicular movement. In III CTZ, extensive movement made it difficult to separate the enemy from friendly military and civilian traffic. Thus SLAR in III Corps was limited to border surveillance. In IV Corps, on the other hand, the VC/NVA used waterways as much as possible, and the Government of Vietnam (GVN) established curfews and wide restrictions on boat and vehicular traffic. In that environment, SLAR was more effective because anything moving contrary to the restrictions was considered to be enemy.[10]

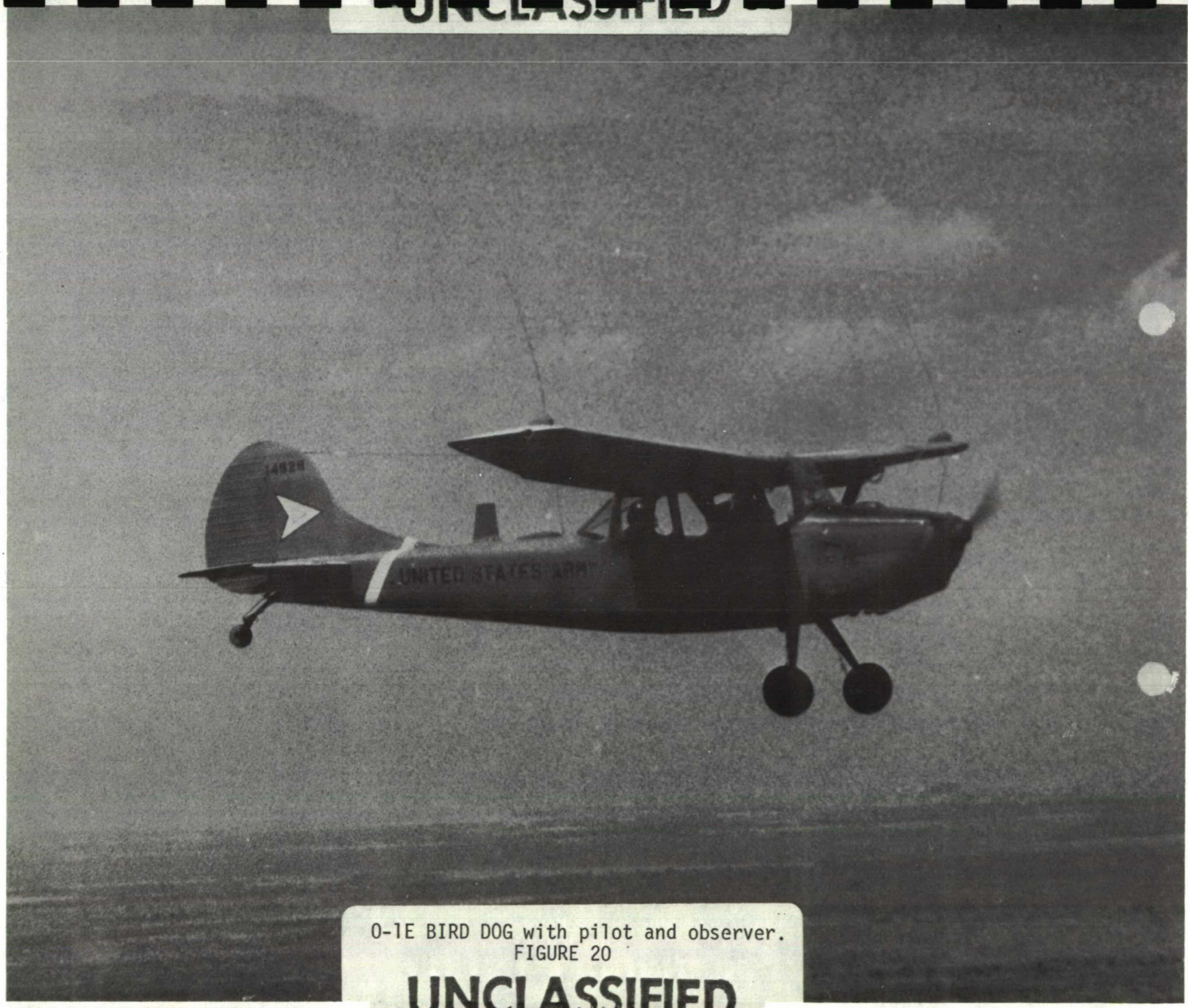
Seasonal limitations affected Red Haze coverage. During the dry season, there were many forest fires and rice paddies burning in the rural areas, along with camp fires and heat emissions from artillery and airstrikes. Consequently, Red Haze turned up a large number of

sightings, most of which were not useful for targeting. In the wet season, however, the reverse was true--few fires of any size burned, people were not usually out with campfires, and wet conditions canceled heat from ordnance that had been expended. Therefore, the wet season heat emissions were generally more accurate and meaningful. Thus, in III Corps, the II FFV units requested more Red Haze during the wet season. SLAR and photo coverage were fairly even throughout the year.[11/]

Reconnaissance

Two companies of reconnaissance aircraft supported Allied ground units in III Corps. They were the 74th and 184th Aviation Companies (Reconnaissance Airplane) belonging to the 12th CAG's 210th Aviation Battalion. Each company had 24 O-1 Bird Dogs. Both units were located at Phu Loi, although in some cases the O-1s stayed with the ground units which they supported. The reconnaissance units were OpCon to II FFV G-2 and dedicated directly to the ground units. Some of their missions were flown as directed by the G-2, but normally were fixed by the supported units. Usually, the O-1 missions included visual reconnaissance (VR), artillery adjustment (AA), radio relay (RR), and naval gunfire adjustment. In addition, the O-1s were capable of directing USAF tactical airstrikes under certain conditions,* and could provide column cover, illumination, wire laying, and message pickup.

* IAW MACV Directive 381-1.



O-1E BIRD DOG with pilot and observer.
FIGURE 20

[redacted]

NORMAL COMMITMENT, RECONNAISSANCE AIRPLANE COMPANIES
IN III CORPS TACTICAL ZONE

74th AVIATION COMPANY

Mission No.	Number of Aircraft	Type Mission	Supported
U-3	2	AA, VR	II FFV Arty
U-3A	1	AA, VR	2/32d Arty
U-3B	1	AA, VR	1/27th Arty
U-6A	1	AA, VR	25th I.D., G-2
U-6C	1	AA, VR	25th I.D., Arty
U-6D	1	AA, RR	25th I.D., Arty
U-7	2	AA, RR	199th Inf Bde
U-7A	1	AA, RR	1st ATF
U-11A	4	AA, RR, VR	ARVN 5th Div.
U-11B	4	AA, RR, VR	ARVN 18th Div.
Total 10	18		9 Units

184th AVIATION COMPANY

U-2	1	VR	II FFV G-2
U-3C	1	AA, VR	6/27th Arty
U-5A	1	AA, VR	3d Bde, 9th I.D.
U-5B	1	AA, VR	3d Bde, 9th I.D.
U-11	2	AA, VR	ARVN 25th Div
U-17	1	Nav Gun	CMAC
U-32	1	AA, VR	3d MSF
U-33	2	RR	Special Forces
U-39	1	VR	Special Forces
Total 9	11		8 Units

LEGEND

AA - Artillery Adjustment
VR - Visual Reconnaissance
RR - Radio Relay
Nav Gun - Naval Gunfire Control

FIGURE 21

[redacted]

On a daily basis, the two companies were committed as shown in Figure 17. The 74th had 18 aircraft in support of nine different ground units, and the 184th provided 11 aircraft each day to eight tactical headquarters. These commitments usually remained static. In the event a supported unit wanted a change in specific commitment, it submitted a modified concept-of-operations paper to the II FFV G-2. There the change was analyzed and if approved sent on to the G-3 and the AAE. The information was then sent to the 210th Aviation Battalion's Operations Center whose officers determined which of the companies would satisfy the requirement. Following this determination, the company was notified generally two or three days in advance, so the ground unit could be notified and liaison initiated between the two.[12/]

The Seventh Air Force Regulation 200-6 required USAF FACs to carry observers whenever possible, and Army O-1s carried two men as well--a pilot and an observer. Each O-1 was usually scheduled for two 3-hour missions per day. Each morning the aircraft flew from Phu Loi to the supported unit headquarters or another location indicated by the mission requirement. The pilot made contact with his assigned observer who briefed him informally on specific mission details for the day. The two men then began their activities, flying one mission in the morning and one in the afternoon. After the afternoon mission, the pilot returned to let the observer off at the pickup point, and then returned to his home base.[13/]

According to one Army source, the ground unit appeared to have too

much control over the way the missions were flown. Sometimes the observers were not prepared to direct the day's missions. At other times, plans were not within the limits of O-1 operational capabilities. And, in some cases, the ground unit received no clear instructions for reconnaissance aircraft usage during the day.[14/]

To alleviate this situation, the 210th Aviation Battalion's S-3 section requested the II FFV G-3 to develop formal concepts of operations for the O-1 units and supported headquarters. By following these guidelines, both units would know the exact capabilities and limitations of the O-1 aircraft and operating parameters could be established. Hopefully, the command influence from higher headquarters would force the ground units to be more responsible in planning the use of the O-1s. The observers or their commanders would be required to prepare formal mission plans and submit them to the O-1 pilot before the missions were flown. If the ground unit misused the O-1s or violated operational concepts, the aviation units could submit unsatisfactory mission reports to higher headquarters. Possibly this system would be more effective than the one used during early 1970.[15/]

[redacted]

CHAPTER V

SUMMARY

The Army aviation assets and operations previewed in this report were those of the 12th Combat Aviation Group (CAG), which had approximately 620 aircraft. Other aviation units in the Republic of Vietnam possessed the same types examined in the 12th CAG, and they used these aircraft according to techniques developed by themselves in their different areas of operation. As was true in the 12th Combat Aviation Group, different methods existed from unit to unit, from AO to AO, and from supported ground unit to supported ground unit.

From a comprehensive standpoint, the possession of organic aviation had increased the combat potential of Army ground units tremendously. The enemy could not be assured that ground troops would follow recognized lines of communications in their approach to objectives. Allied ground troops came from any direction, over any terrain. They arrived near an objective relatively fresh for battle and in large numbers. They arrived quickly, not allowing the enemy time to exploit a local tactical advantage. Additionally, friendly ground units were not limited by ground resupply: their food, ammunition, and other material for combat could be brought to them directly, with very little fear that the enemy could isolate the battlefield.

According to Army sources, organic aviation assets multiplied friendly troop numbers. A few commanders considered their units--with helicopters--

[redacted]

could carry out operations with the same effect as ground units as much as fifteen times as large but without aviation. Others believed six, or eight-to-one, was a more realistic figure. All agreed that without the advantages that helicopters gave the ground commander, a much larger force would be required.

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APPENDIX I

U.S. ARMY AIRCRAFT BASIS OF ISSUE BY MAJOR UNIT, 1966

Unit	TO&E No.	Rotary wing			Fixed wing		
		Obs.	Utility transport	Transport	SURV.	Utility transport	Transport
AV CO (DIV)	1-07D	44	9				
AV CO—SURVL SETAF	1-37D	2	6	------	6	------	2
AVCO—BRIGADE	1-47E	18	14				
AV BN (Airborne Div)	1-55E	10	31	------	6		
AV CO, AM, FW	1-59D	------	------	------	------	------	16
AV BB (AR—INF—INF (M))	1-75E	10	31	------	4		
AV CO—AIR MOB LT (DIV)	1-77E	------	25				
AVN GSC (DIV)	1-78E	10	6	------	4		
AVN GROUP (AM DIV)	1-100	19	154	48	6		
GS, AVN CO. (AM DIV)	1-102	10	10	------	6		
AV CO—FW LT TRAN	1-107T	------	------	------	------	------	16
AV CO CORPS	1-127D	16	12	------	------	1	
AV CO SURVL	1-128T	------	------	------	18		
AV CO—ARMY	1-137D	10	12	------	------	3	
ASLT, HELI BN (AM DIV)	1-155	3	72				
HHC, ASLT HCPTR BN (AM DIV)	1-156	3					
AERIAL WPS CO (AM DIV)	1-157	------	12				
ASLT, HCPTR CO (AM DIV)	1-158	------	20				
ASLT, SPT HCPTR BN (AM DIV)	1-165	3	------	48			
HHC, ASLT SPT HCPTR BN	1-166	3					
ASLT SPT HCPTR CO	1-167	------	------	16			
AV CO AIR MOB MED	1-258F	12	------	96			
AVN CO SF GP	1-307E	------	12	------	------	------	4 (U-10)
EN AVN SEC AUG	5-36D	1					
EN GP COMBT HHC	5-52D	68	136				
EN GP CONST HHC	5-112D	1	2				
EN BN CONST	5-115D	1	1				
EN AV SEC AUG	5-116D	1	1				
EN GP, MS	5-262R	------	2				
EN BDE	5-301R	------	2				
EN PLT TOPO AV	5-343P	12	6	------	------	------	3
EN BN TOPO HHD	5-346D	1	1				
EN CO BASE SURVEY	5-348D	3	1				
EN BN AMPHIB	5-401E	------	4				
CMD AMPH SPT	5-601T	------	4				
AB DIV ARTY HHB	6-201E	10					
DV ARTY HHB	6-302E	20					
BN FA, 105mm SP	6-315D	2					
FA AV SEC AUG	6-316D	2					
FA GP HHB AUG	6-401E	2					
BN FA, 105mm, T	6-405D	2					
FA AV SEC AUG	6-406D	2					
FA BN 8 IN (T)	6-415E	24					
BN FA, 155mm, T	6-425D	2					
FA AV SEC AUG	6-426D	2					
FA BN 175 SP	6-435D	2					
FA BN 8 IN SP	6-445E	2					
FA AUG AVN DET	6-501D	2	1				
AVN BTY, CORPS ARTY FW	6-517D	8	18	------	12		
BN FA TARGT HEQ	6-575E	3					
FA AV SEC AUG	6-576E	3					
FA BN PERSHING	6-615T	------	4				

SOURCE: FM-101-20; ACSFOR, DA. This APPENDIX is intended to show the many different types of Army units which had aircraft in the mid-sixties. The numbers and mixes had been extensively modified upon entry into operations in RVN.

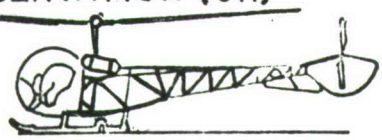
[redacted]

Unit	TO&E No.	Rotary wing			Fixed wing		
		Obs.	Utility transport	Transport	SURV.	Utility transport	Transport
DIV ARTY (AM DIV)	6-700	16	43				
AVN BTRY (AM DIV)	6-702	16	4				
AERIAL ARTY BN (AM DIV)	6-725	------	39				
	6-726	------	3				
AERIAL ARTY BTRY (AM DIV)	6-727	------	12				
INFANTRY DIV	7E	47	50	4			
IN BDE HHC	7-42E	6					
INF BRIGADE	7-102E	18	14				
MEDICAL BN (AM DIV)	8-25	------	12				
HQRS & SPT CO (AM DIV)	8-26	------	12				
MO CO AIR AMB	8-137D	------	25				
MED CO AA	8-137E	------	25				
MD DET HCPTR AMB	8-500D	------	6				
ORD GP, M&S	9-12E	------	1				
ORD GP, AMMO	9-22E	1					
AUG BN PET OPHHD	10-206D	1	1				
SC AUG SEC AVN	11-17D	2	4				
SC GP	11-22E	------	5				
SC CO CMBT EW IN	11-67D	------	------	------	------	------	3
SC CO CMBT EW AR	11-68D	------	------	------	------	------	3
SIG BN ARMY	11-95D	2	6				
SIG BN ARMY AUC	11-96D	2	4				
SIG BN, SPT	11-116D	------	2				
SC CO SPT	11-117R	2					
SIG BN ABN CORPS	11-225E	------	7				
AIRBORNE DIVISION	17E	47	50	------	4		
AR BDE HHC	17-42E	12					
AR RGT CAV	17-51D	16	6				
AR CAV REGT	17-51E	17	31				
H&HT ACR	17-52E	2	8				
H&HT SQD ACR	17-55E	2	2				
AIR CAV TRP ACR	17-58E	9	17				
CAV SQN ABN DIV	17-75E	9	17				
CAV SQN (AM DIV)	17-95T	20	58				
HHT CAV SQD (AM DIV)	17-96T	------	7				
AIR CAV TRP	17-98T	10	17				
CAV SQN DIV	17-105E	18	34				
CAV TROOP (BG DE)	17-127E	4					
CAV TROOP AIR SEP	17-408T	9	17				
INF DIV SCT	20-45D	2	1				
INF DIV TNG	29-7T	3	1				
IN DIV MNT BN	29-15E	------	10				
IN DIV MNT BN (M)	29-25E	------	2				
AR DIV MNT BN	29-35E	------	4				

Source: ACSFOR.

Unit	TO&E No.	Rotary wing			Fixed wing		
		Obs.	Utility transport	Transport	SURV.	Utility transport	Transport
AB DIV MNT BN	29-55E	------	2				
AB BDGE SPT BN	29-105E	------	1				
AV DET TM EA	29-500D	1					
AV DET TM EB	29-500D	------	------	------	------	1	
AV DET TM EC	29-500D	1					
AV DET TM ED	29-500D	------	1				
AV DET TM EE	29-500D	------	1				
MI BN AIR RCN SPT	30-5D	------	8				
SF GP AB	31-105E	------	12	------	------	4	4
AV DET SPWAR (ASU)	31-500T						
TM BA		1					
TM BB		1					
TM CB		2					
AS HHC GP	32-52D	1	4				
AS AV SEC AUG	32-56E	1	1				
AS BN	32-56F	------	2				
INF DIV (MECH)	37E	47	50	------	------	4	
INF BDE W/AV COS	37-100E	54	42				
INF BRIGADE (MECH)	37-102E	18	14				
IN BDE HHC (M)	37-42E	6					
MI CMD AIR HHC	39-52D	2	2	------	4		
AIR DEFENSE GP	44-02D	3					
AD ARTY BDES W/AUG	44-02D	9					
AD AUG AV SEC	44-2E	------	5				
AIR DEFENSE GP	44-12D	1	1				
AD ARTY GPS W/AUG	44-12D	8					
AD GP HHB AUG	44-112D	2	1				
BDE AIR DEF HHB	44-102D	2	4				
TC CO DS	44-347E	------	2				
MSL BN AD (HERC)	44-545D	2					
HQ HHC ARMY	51-2D	5	2				
LOG CMD	54-102D	------	4				
TCGP, TRK	55-12E	1					
TC BN TRANS ACFT	55-56D	3	1				
TC CO LT HCPTR	55-57D	2	20				
TRANSP AIRCRAFT (AM DIV)	55-405	4	5				
HQ & HQ CO. (AM DIV)	55-406	1					
MAINT & SUPPLY CO. (AM DIV)	55-407	1					
TC AUG SPT FLT SEC	55-456D	------	2				
TC CO DS	55-457D	------	2				
TC CO DS	55-457E	------	2				
TC CO AC MNT GS	55-458D	------	2				
ABN DIV	57E	47	5	------	6		
AB BDE HHC	57-42E	6					
AB BDE HHC	57-102E	6	8				

OBSERVATION (OH)



BELL OH-13 *

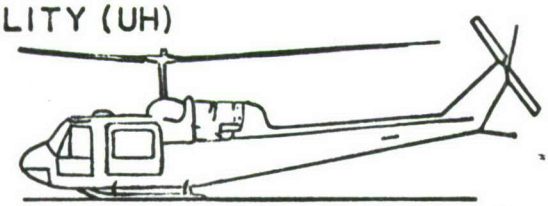
HILLER OH 23 *

HUGHES OH-6

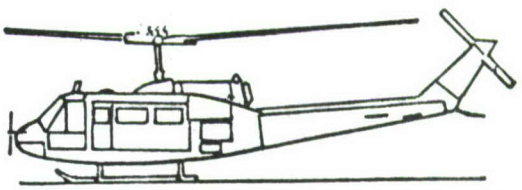
OH-58

APPENDIX II
U.S. ARMY HELICOPTERS 1961 TO 1970

UTILITY (UH)

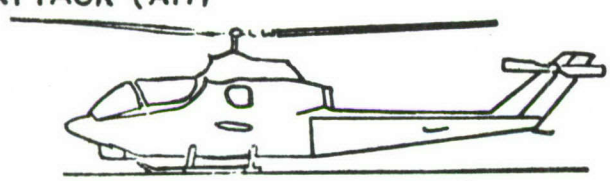


BELL UH-1B/C (HUEY GUNSHIP)
(UH-19D* Not Shown)

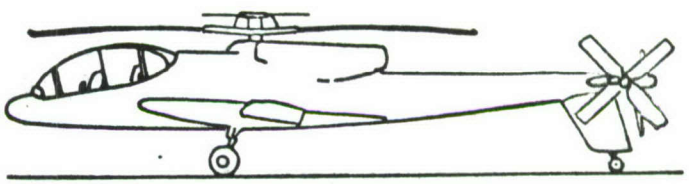


BELL UH-1D/H (HUEY OR SLICK)

ATTACK (AH)

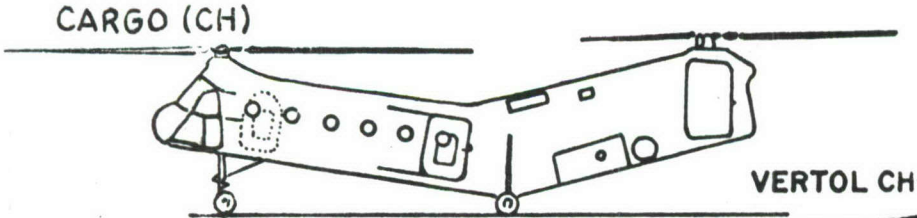


BELL AH-1G (COBRA)



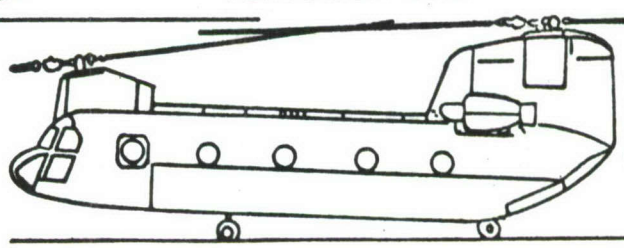
LOCKHEED AH-56A (CHEYENNE)
(Not used in RVN — Development cancelled)

CARGO (CH)

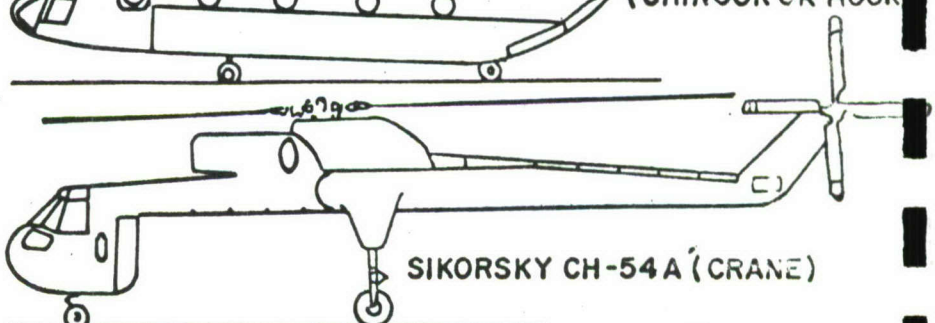


VERTOL CH-21 *

(CH-34C* Not Shown)



BOEING-VERTOL
CH-47A, B & C
(CHINOOK OR HOOK)



SIKORSKY CH-54A (CRANE)

* *NO LONGER USED IN RVN.*

APPENDIX III

NOTES ON AGREEMENTS AND DOCTRINE, U.S. ARMY-USAF AIRCRAFT

Year	Title	Authority or Participants	Action
1947	National Security Act	Congress	Affirmed the strategic bombing mission and independence of air-power; included close air support as an Air Force mission.
1952	Pace-Finletter Memo	U.S. Army and Air Force Secretaries	Limited the Army to aircraft for certain missions. Aerial fire support was not included. Limited Army fixed-wing aircraft to 5,000-pounds empty weight. (By later Agreement: OV-1's weight was about 10,000-pounds empty and U-21s about 5,400). Army aircraft were not to duplicate functions of USAF; CAS was one of those functions.
1957	DOD Directive 5160.22	Department of Defense	Reaffirmed and clarified Pace-Finletter memo. Additionally, limited Army helicopters to 20,000 pounds empty weight. (CH-47s weight 20,450 to 23,400-pounds empty and CH-54s about 20,000.)
1958-1961		U.S. Army	Development and production of CV-2 Tactical Transport aircraft under way. A production model of this twin-engine cargo airplane weighed over 18,500-pounds empty.
1959	"Unified Services" Document.	Joint Chiefs of Staff	Again charged USAF with CAS for Army, plus development of equipment, tactics, and techniques.

1961-1962		Department of Defense	Secretary of Defense McNamara pushing Army airmobility. The Howze Board Report, the airmobile division, and more Army aerial fire support resulted. McNamara directed USAF to restudy tactical airpower needs, implying that a larger tactical air force was needed, particularly for CAS.
1963		U.S. Army	Development of twin-engine, turboprop CV-7A Buffalo tactical transport was begun by Army and contractors. It had an empty weight of 22,800-pounds. The Buffalo never entered production.
1965	AFM-2-52/ FM 100-25	USAF/ U.S. Army	Joint manual on air support proposed, but not approved or published.
1966	Johnson-McConnell Agreement	USAF/U.S. Army Chiefs of Staff	The Army turned over all CV-X2 transports and their mission to USAF (CV-2s redesignated on C-7s); USAF gave up all claims on Army helicopters including those for aerial fire support; USAF airlift could be attached to Army commands under certain conditions.
1967	Doctrine for Close Air Support of Land Forces	USAF/U.S. Army	A draft joint publication on CAS was prepared, but never approved or published.
1968		Department of Defense	Secretary of Defense McNamara approved Army procurement of 375 AH-56 aerial fire support helicopters; subsequently canceled for technical difficulties; but Army continued to request AH-56 development.
1969-1970	Combined USAF/ U.S. Army Research	USAF/ U.S. Army	The two services requested a combined R&D budget of $45.6 million for AH-56/A-X ($17.6-million for AH-56, $28-million for A-X). Congress questioning budget request.

[redacted]

Early 1970	Department of Defense	Secretary of Defense Packard wrote the Army and the USAF that he looked upon the AH-56/ A-X as complementary, not competitive. (Authorities from both services testifying in Congress about need for each aircraft.)

[redacted]

GLOSSARY

AA	Artillery Adjustment
AAA	Antiaircraft Artillery
AAE	Army Aviation Element
AC	Aircraft Commander
AGL	Above Ground Level
AH	Attack Helicopter
AHC	Assault Helicopter Company
AMC	Air Mission Commander
AMTFC	Airmobile Task Force Commander
AO	Area of Operation
ARP	Aero Rifle Platoon
ARRS	Aerospace Rescue and Recovery Squadron
ARVN	Army of Republic of Vietnam
ASHC	Assault Support Helicopter Company
AWC	Aerial Weapons Company
BDA	Bomb Damage Assessment
BDE	Brigade
BHAB	Bien Hoa Air Base
BHTAC	Bien Hoa Tactical Area Command
Bird Dog	O-1 Aircraft
Blade Hour	Measure of Helicopter Flight Time
BOC	Battalion Operations Center
CAB	Combat Aviation Battalion
CAC	Corps Aviation Company
CAG	Combat Aviation Group
CAP	Combat Air Patrol
CAS	Close Air Support (Army Aviation: CFS)
CAV	Cavalry
CBU	Cluster Bomb Unit
C+C	Command and Control Helicopter
CFS	Close Fire Support
CG	Commanding General
CH	Cargo Helicopter
CHINOOK	CH-47 Helicopter
CMAC	Capital Military Assistance Command
CO	Commanding Officer
COBRA	AH-1G Helicopter
CRANE	CH-54 Helicopter
CSG	Combat Support Group
CTZ	Corps Tactical Zone

DA	Department of the Army
ECM	Electronic Countermeasures
EOTR	End of Tour Report
ESB	Emergency Standby
FAC	Forward Air Controller
FFV	Field Force Vietnam
FSB	Fire Support Base
FWMAF	Free World Military Assistance Forces
GIB	Guy in Back
Gunship	Armed Helicopter
GVN	Government of Vietnam
HUEY	UH-1 Helicopter
HFT	Heavy Fire Team
I.D.	Infantry Division
KBA	Killed by Air
LFT	Light Fire Team
LNO	Liaison Officer
LOC	Line of Communications
LOH	Light Observation Helicopter
LORAN	Long-Range Navigation
LZ	Landing Zone
MACV	Military Assistance Command, Vietnam
mm	millimeter
MOHAWK	OV-1 Aircraft
NM	Nautical Mile
NOD	Night Observation Device
OH	Observation Helicopter
OpCon	Operational Control
OPlan	Operations Plan
Package	Helicopter Planning Figure
Red Haze	Infrared Surveillance
RIP	Rest in Peace
RP	Reporting Point
RR	Radio Relay
RTAFB	Royal Thai Air Force Base
RVN	Republic of Vietnam

SAM	Surface-to-Air Missile
SLAR	Side-Looking Airborne Radar
SLICK	Troop-Carrying Helicopter
TACC	Tactical Air Control Center
TFW	Tactical Fighter Wing
TOE	Table of Organization and Equipment
TpOC	Troop Operations Center
TRW	Tactical Reconnaissance Wing
TV	Television
U	Utility Aircraft, Fixed-Wing
UH	Utility Helicopter
USARV	United States Army, Vietnam
USN	United States Navy
VC/NVA	Viet Cong/North Vietnamese Army
VHF	Very High Frequency
VR	Visual Reconnaissance
XM	Helicopter Weapons System